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MODERN METALS

Dr. J. D. Hanawalt, Vice President, The Dow Chemical Co.

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A REALISTIC APPRAISAL

•

The Outlook for Wrought Magnesium In Commercial Markets

(see article beginning on page 32)

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AJAX Steel and Forge Co.

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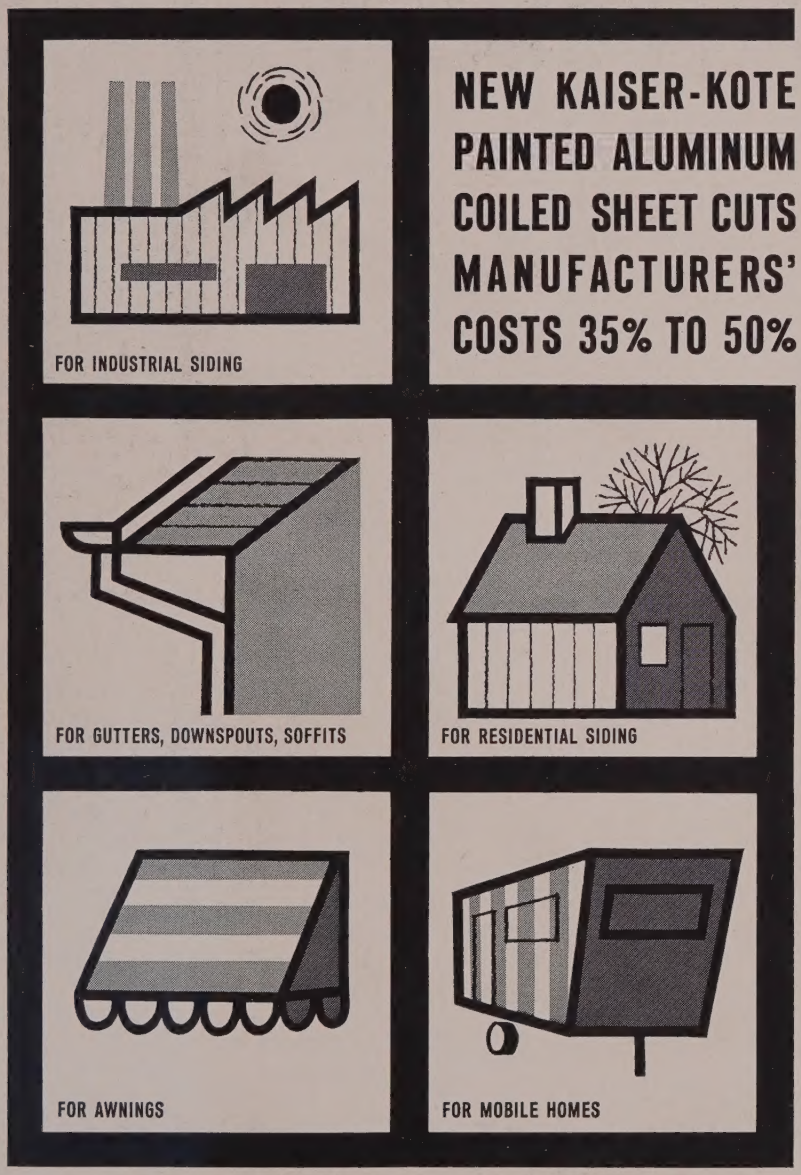
KAISER ALUMINUM

ALUMINEWS


NEW KAISER-KOTE PAINTED ALUMINUM COILED SHEET CUTS MANUFACTURERS' COSTS 35% TO 50%
FOR INDUSTRIAL SIDING
FOR GUTTERS, DOWNSPOUTS, SOFFITS
FOR RESIDENTIAL SIDING
FOR AWNINGS
FOR MOBILE HOMES

Kaiser-Kote, a new painted aluminum coiled sheet that comes already finished, eliminates painting after fabricating—cuts costs by 35% to 50%. Not just a painted surface, Kaiser-Kote is a durable, sparkling enameled finish, factory-fused to the metal.

Kaiser-Kote eliminates the need for paint facilities in your plant, unnecessary personnel, and large paint inventories. It comes in a broad range of modern colors, ready for continuous, high-speed sheet fabrication from coils up to 66″ wide.

And it's easy to form. Kaiser-Kote is readily adaptable to bending, brake or roll forming, crimping, or blanking without damage to the finish.

A CONTROLLED QUALITY FINISH Kaiser-Kote is produced with today's most modern roll-coating equipment. Along each step of the color coating process, careful scientific controls assure constant and uniform bonding of color on the aluminum sheet. Such regulation of uniformity and bonding assures the finest, most durable finish available anywhere.

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WIDE RANGE OF ALLOYS Kaiser-Kote is supplied in a full choice of alloys and tempers—and every practical gauge—to meet your specific requirements. Your Kaiser Aluminum salesman or distributor will help you select the best aluminum alloy and finish for forming your product.

For complete details about Kaiser-Kote, send for Kaiser Aluminum's free brochure, "Kaiser-Kote Painted Sheet". Mail the coupon now!

Gentlemen:

Please send me a free copy of your brochure, **"Kaiser-Kote Painted Sheet".**

Kaiser Aluminum & Chemical Sales, Inc.
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KAISER ALUMINUM

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6–Stand continuous horizontal and vertical Billet Mill

UNITED ENGINEERING AND FOUNDRY COMPANY
PITTSBURGH, PENNSYLVANIA

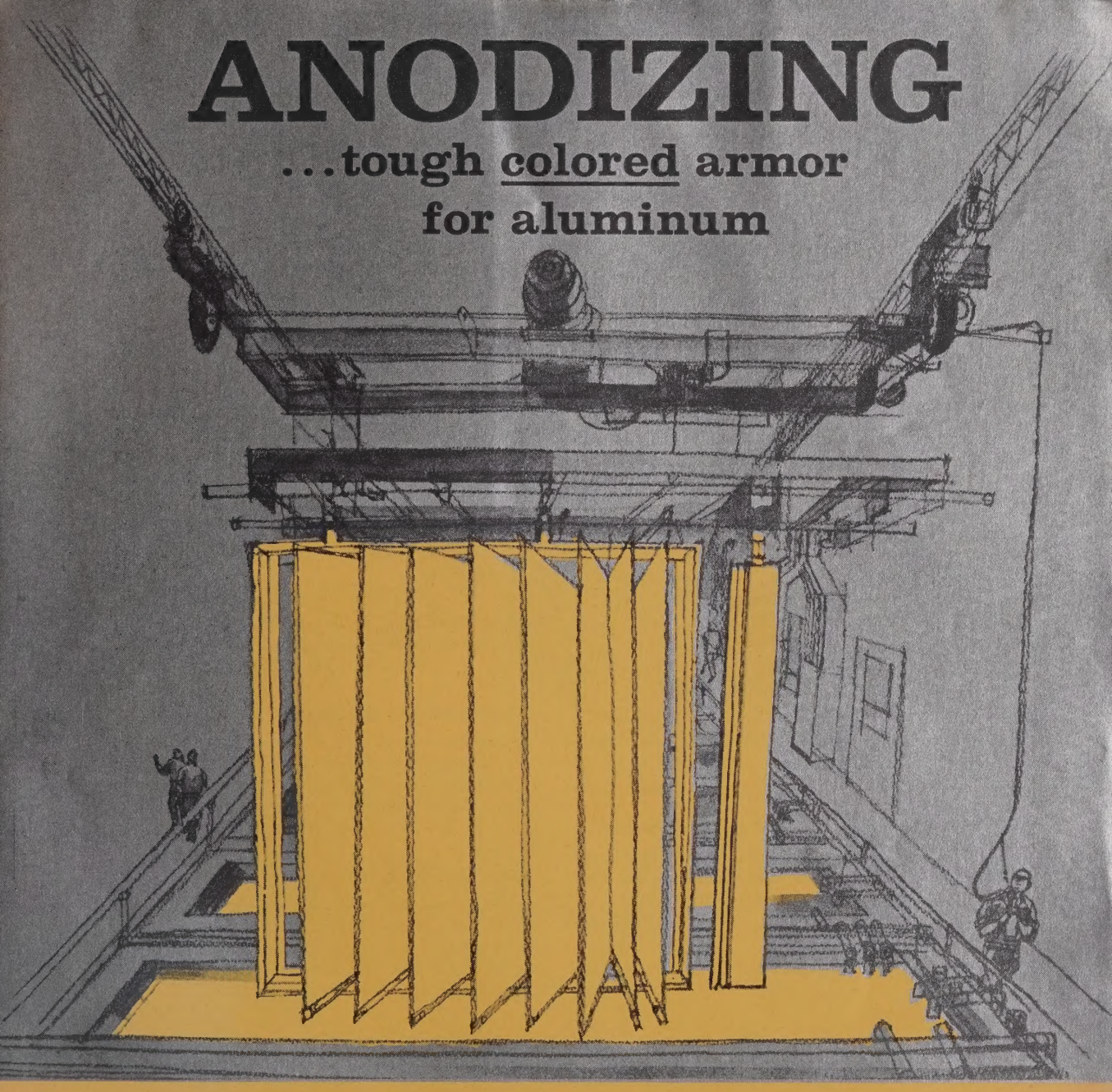
Plants at Pittsburgh, Vandergrift, Youngstown, Canton, Wilmington

SUBSIDIARIES: Adamson United Company, Akron, Ohio; Stedman Foundry and Machine Co., Inc., Aurora, Indiana

Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

ANODIZING

...tough colored armor for aluminum



Anodizing gives aluminum a hard, lustrous armor against abrasion, scratches, and weathering.

This thin, tough oxide film adds to aluminum's natural corrosion-resistance, and provides extra protection against weathering and abrasion. But the reason many designers and manufacturers are interested in anodizing is that it is an effective way to add clear, lasting *color* to aluminum products.

Because of its color, its resistance to weathering and corrosion, and its low maintenance features, anodized aluminum is used in more and more new buildings—indoors and out, structurally and decoratively. And it has found wide application in appliances, furniture, housewares, automobiles, and hardware, to name just a few uses.

With anodizing, you can select from a wide range of finishes—from bright, lustrous clear to soft matte finishes—from clear finishes to opaque greys. And these finishes are available in several colors.

The full anodizing process usually includes preliminary mechanical finishing, cleaning, etching or chemical brightening, anodizing, neutralizing, and sealing. The result: an aluminum finish that is extra-hard, extra-resistant to abrasion, corrosion, weathering, and wear—plus lasting, lustrous *color*.

Some of the important facts about anodizing are given on the next page. For complete details about the potentials and properties of anodized aluminum, or about Reynolds anodizing facilities, send in the coupon on the next page.

important things to know about anodizing aluminum

What Anodizing Is

Anodizing is the building of an aluminum oxide from .0008 to .001 in. thick on aluminum electrochemically. The aluminum part to be anodized is made electrically positive in an electrolytic bath, usually sulfuric acid.

What Anodizing Does

1. Provides a hard, abrasion-resistant surface on the aluminum
2. Preserves the natural sheen and appearance of aluminum
3. Increases the natural corrosion-resistance of aluminum
4. Enables you to add permanent colors to the surface of aluminum
5. Insulates aluminum surface against passage of electricity

How to Specify Anodizing

Always specify minimum anodic film thickness, not anodizing time. Film thickness can be checked by eddy current principle with accurate instruments available.

Film Thicknesses Recommended

Thickness of the anodized film will depend on product design and service requirements, but following are some average specifications:

Decorative anodizing	.00012″
Appliance parts	.0002
Automotive parts	.00025
Interior architectural	.0004
Maximum wear areas	.0008
Maximum color fastness	.0008
Exterior architectural	.0008

Color Anodizing

For architectural applications where fade-resistance is important, the best anodized colors are natural (clear), black, and several shades of grey and gold. For applications other than architectural there is a wide range of acceptable colors.

Anodizing Alloys

Various aluminum alloys affect the anodic films differently. Anodic films on alloys with smaller amounts of manganese, silicon, and copper will be clearer, less grey. Alloys with copper, lead, and zinc will be more difficult to anodize effectively. For decorative anodizing, the following alloys are recommended:

5005, 5357, 5457, 5557, 5657, 6063, 6463, RF-10, RF-15, RF-20

For bright anodizing, the following alloys are recommended:

5357, 5457, 5557, 5657, 6063, 6463, RF-10

Clear anodizing is recommended for casting alloys, the following alloys being best:

214, C-214, F-214, 218, 220

Dimensions Change

Anodizing will change the dimensions of a part . . . "normal" anodizing will increase the surface thickness by one-third the thickness of the anodic film; "hard" anodizing increases surface thickness by one-half the thickness of the film.

Anodizing Costs

Figure anodizing costs by the thickness of the film. Cost is usually quoted per square foot of one finished surface, although smaller parts are quoted per part. Anodizing on automatic equipment is usually most economical.

Anodizing Facilities

Reynolds has two large anodizing facilities which can handle parts up to 25 feet long and 12 feet wide. There are also many reputable anodizing firms throughout the country — the local Reynolds sales office can assist you in selecting one in your immediate area.

REYNOLDS ALUMINUM

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV

Reynolds Metals Company
P.O. Box 2346-GM, Richmond 18, Virginia

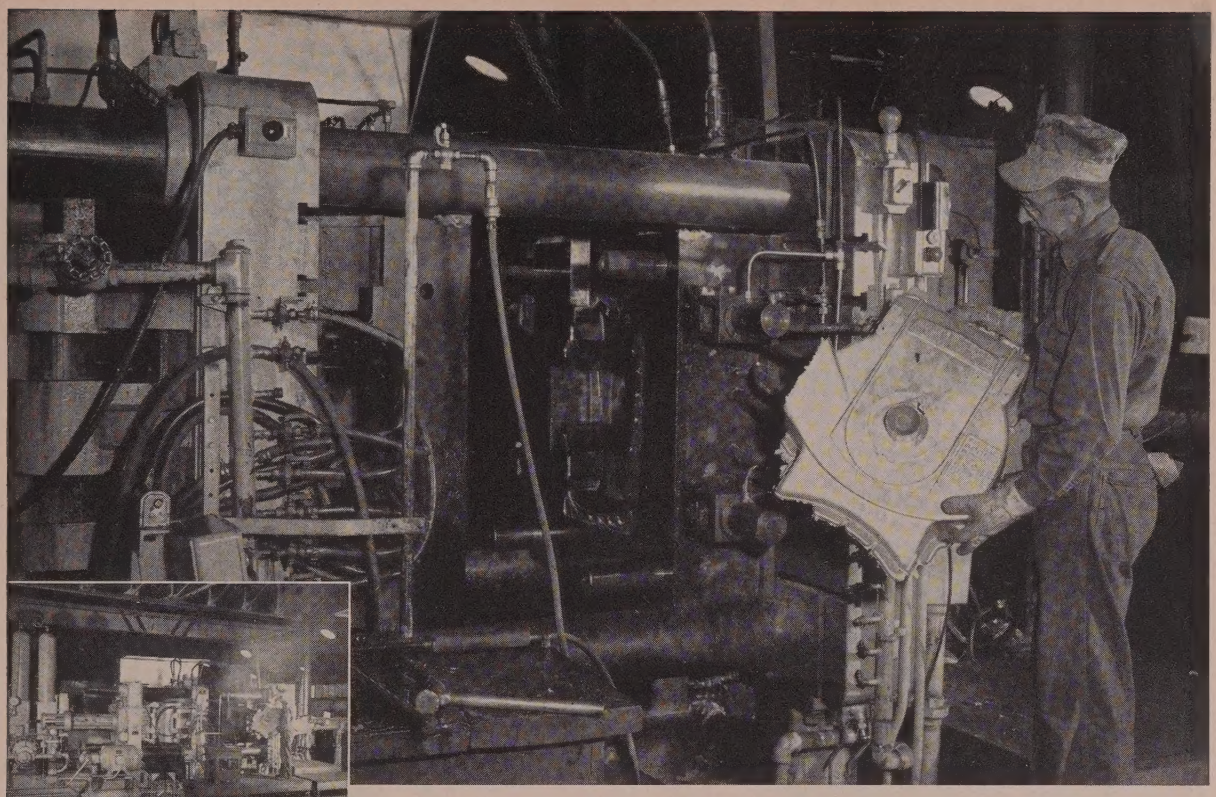
Please send me details on anodizing, and on the Reynolds anodizing services and facilities.

Name_____

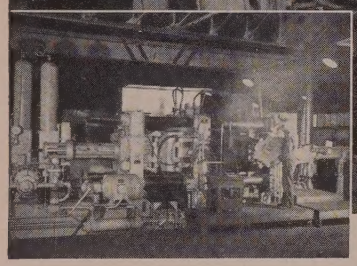
Firm_____

Address_____

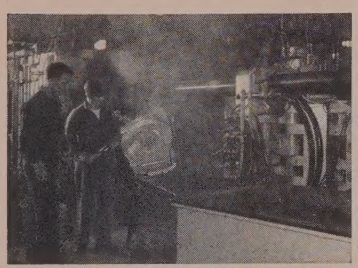
City_____ Zone____ State_____



● Big, solid 17 lb. castings are housings for rotary power lawn mowers. Production averages 80 housings per hour. This is a 1000-ton Cast-Master Die Casting machine — one of two in this plant.



● All operating elements of this efficient 1000-ton Cast-Master are conveniently accessible for instant adjustment or inspection.



● Cast housings are removed from die, inspected and then dunked in the cooling tank at right. Parts are conveyor fed to trimming presses, then drilled and cleaned prior to assembly.

● Minor finishing is required after trimming. The racks in background represent about one-half hour's production for one machine.

"CAST-MASTER'S TOGGLE CLAMPING GIVES US UNIFORM DENSITY-LESS FLASH"

G. L. Graft, Divisional Supt. for The Newark Ohio Company Newark, Ohio stated, "We like Cast-Master's die locking toggle mechanism and the rugged qualities of these machines. They've been doing a fine job for us on all sizes of castings up to 17 lbs. each. They're fast; scrap loss and flash are negligible." This company manufactures Kenmore Electric Ranges and Craftsman Rotary Power Lawn Mowers, exclusively for Sears, Roebuck and Company.

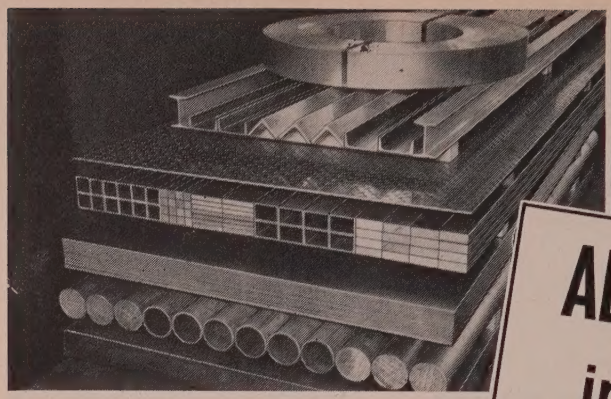
If you're moving into the die casting field involving new, larger castings, investigate the Cast-Master line of high production die casting machines — 100-ton to 2000-ton capacities—cold chamber or hot chamber models. Write for Bulletin CM-100.

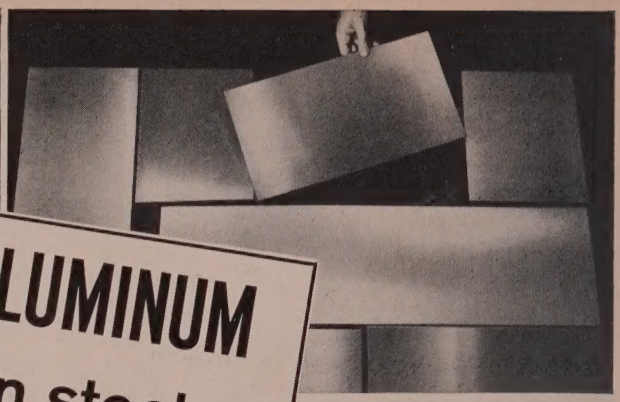
H26

H-P-M DIVISION - KOEHRING COMPANY

CAST-MASTER

23901 AURORA ROAD, BEDFORD, OHIO





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Bar
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Structural Shapes
Angles, channels, tees and I-beams.

Extruded Architectural Shapes
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Round, 3/16" to 6" diameter. Also square and rectangular tubing.

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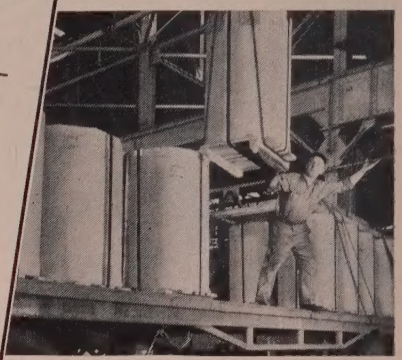
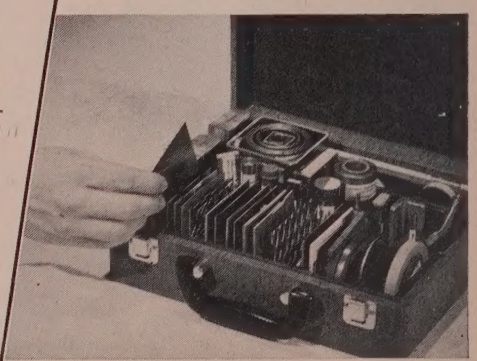
SHEET PLAN
eliminates scrap. We can produce exact lengths and widths from coil stock for most users—usually on a net-weight basis.



HELP IN SELECTION
Your Ryerson representative can recommend the best aluminum alloy for each application to do the job faster, better—at less cost.

DEPENDABLE DELIVERY
Finest care in handling and packaging and production-line-timed shipments assure fastest service. Any quantity—when you need it.



HELP IN FABRICATION
Experienced aluminum specialists are always ready to assist you with technical fabrication problems.

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MODERN METALS
Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

ON THE COVER: Magnesium will have to compete with many materials in bidding for commercial markets, but its closest rival in many cases will be aluminum. In the article beginning on page 32 the magnesium industry's top authority compares the properties and characteristics that should loom large in most competitive skirmishes between the two metals. Our impression of Dr. Hanawalt's message is that in many applications a better part or product can be made of magnesium at little or no additional cost. It will take some intensive promotion to convince many manufacturers of this. Maybe this article will help.

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Modern Metals

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The Weather-Proof Company

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Letters

Statesmanship In Aluminum

Sirs:

We have read with interest parts I and II of the Yates Committee hearings on aluminum and note that part III will appear in August.

It would seem from the testimony you have already published that the aluminum industry is quite immature when it comes to operating in a slump such as the present one.

As a fairly substantial new user of aluminum, our company finds it difficult to understand all this price fluctuation "under the counter" when book prices remain the same. This is not in keeping with the great forward look aluminum firms would like us to believe they practice. Surely they know the history of price-cutting in the steel and copper industries.

If you are reprinting the series, please send me three copies. . . .

"S"—Ohio

MM—You, sir, are not alone if you don't understand what's going on insofar as aluminum prices are concerned. For some details, see our "Looking Ahead" column on page 98 in this issue.

Your letter reminds us of a New York brokerage firm that published a newsletter on the subject last month. They titled it: "A Call for Industrial Statesmanship in the Aluminum Industry." It starts off like this: "For the past two and one-half years the domestic aluminum industry has been buffeted profitwise by undisciplined and profitless price cutting of semi and fabricated products. . . ."

This non-user firm states the problem all too clearly. If anyone wants a copy, write to Donald Macurda, F. S. Smithers & Co., 45 Wall St., New York 5, N. Y.

Aluminum's Working On the Railroad

Sirs:

I'm sorry your very detailed article on aluminum applications in freight cars couldn't await complete data on Pacific Fruit Express Co.'s use of the metal in refrigerator cars.

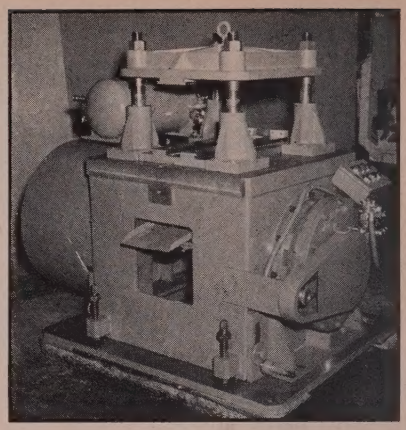
For several years we have been working with various aluminum companies endeavoring to develop economical applications of aluminum in new car construction as well as for replacement parts.

Most of the obstacles have involved the excessive cost of fabricated aluminum. However, in some cases the saving in weight has justified the extra cost. We are interested in manipulated parts of a car, such as hatch plugs, doors, load dividers, floor racks, etc., where a reduction in weight expedites car repairs or car cleaning.

At the present time aluminum is being used in our cars as follows:

1. In mechanical refrigerator cars, where good heat conductivity and quick release of latent heat are required, we are using embossed aluminum sheets .04" thick, held in place by aluminum extrusions secured to wood stringers in ceiling by means of screws.

2. Aluminum is also used for floor rack stringers, saving considerable weight and adding strength to an item that is often exposed to excessive damage. These stringers are 3-inch, 1.406-lb. "I" beams to which the wooden floor rack slats are secured by aluminum self-tapping screws. Floor rack



MRF Cut Off Press...

This cut off and notching press is available in 5 models: 8 to 50 ton . . . die widths from 9" to 20" . . . motors from 1 to 15 HP. Full wave rectification for closer moulding length accuracy. "MICHIGAN" is also a specialist in rolls and roll forming equipment. *Send for new brochure.*

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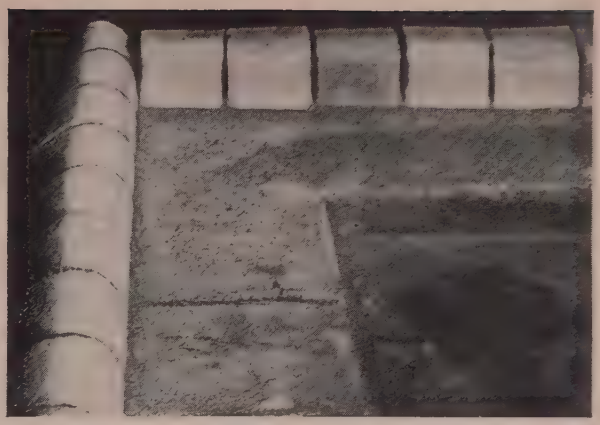
452 W. Chicago Ave. Chicago 10, Ill.

Phone SU 7-7664

B&W Kaocrete-D, vibrated in place, provides high resistance to the atmospheres encountered in this coke oven door installation. Furthermore, the high erosion resistance and long service life without loss of strength of B&W Kaocrete-D add to its suitability in this application.



A typical monolithic curb wall construction in an annealing furnace using a carbon monoxide atmosphere. The greatly reduced number of joints in which sealing sand can penetrate prevents structural spalling of B&W Kaocrete-A upon heating and cooling. Being monolithic, gas leaks are practically eliminated.

A radiant tube annealing furnace with a base of Kaocrete-A, backed up with Kaolite-20, one of B&W's insulating refractory castables. This furnace operates at approximately 1700 F in a 65% CO atmosphere.

A stack annealing furnace with pedestals cast of B&W Kaocrete-A. The atmosphere is slightly above 8% CO. B&W Kaocrete-A offers strength, volume stability and resistance to carbon monoxide disintegration.

How B&W refractory castables perform in atmosphere applications

One of the difficult problems facing furnace builders and operators in the metals industries is the effect of atmospheres on refractory linings. That's why B&W offers several *specialized* refractory castables for this service, each possessing strength, volume stability and the refractoriness necessary to assure long, trouble-free service.

Take B&W Kaocrete-A, for example. Because of the careful selection and processing of special aggregates and other ingredients with low iron content, this material resists disintegration or other effects produced by high concentrations of CO or H_2 atmospheres. B&W Kaocast and Kaocrete-32 provide the same excellent service at higher temperatures while lightweight Kaolite-20 is outstanding as an insulating castable in atmosphere applications.

B&W Bulletin R-35A gives additional information on versatile B&W refractory castables. Write for your copy of this bulletin to The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N. Y.

R632

B&W

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REFRACTORIES DIVISION

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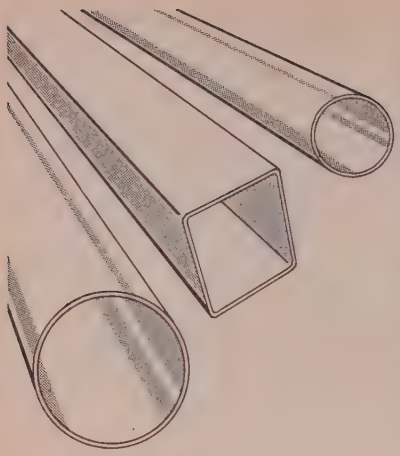

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gate hinges are also aluminum.

3. Drain pans at ends of car are sheet aluminum.

4. In the near future 10 cars will be equipped with aluminum load dividers. We anticipate a saving of at least 1500 pounds per car which we feel may justify the cost over conventional steel load dividers.

5. Aluminum doors are also being considered and this may save from 400 to 500 lbs. per car. However, it is questionable as to whether or not the saving of possibly 500 lbs. can be justified for this item.

The 1025 cars now under construction are equipped with conventional steel doors with plastic door liners, rather than doors fabricated entirely of plastic, as the newspaper report referred to in your article indicated. The combination of steel and plastic results in much improved insulation at doors, and also a saving of about 450 pounds per car.

If and when we equip cars with aluminum doors and plastic liner we will have a very light and efficient door, and again there will be a question as to whether or not cost of such doors can be justified.

We have made some tests with refrigerator car doors completely constructed of plastic with a tremendous saving in weight but questionable durability and exceedingly high cost.

We do not know as yet what the service life of plastic door liners will be, but the material appears to be very good for this purpose.

"T"—Calif.

Sirs:

Your article on the growing use of aluminum in railroad freight cars (July '60, p. 76) is very revealing to us. When we received your survey letter and questionnaire we had no idea of the broad approach you were taking.

At any rate, it is as thorough an analysis of the use of aluminum in our industry as we have ever seen. We were particularly interested in what some of the other roads are doing.

If reprints are being made, we can use 20 for our personnel who are interested in cutting our car building costs and investigating new materials like aluminum. . . .

"J"—Ill.

MM—Although readers have expressed considerable interest in our July cover story on aluminum in freight cars, we are not yet sure whether this 8-page feature will be reprinted. If it is to be reprinted, an announcement will be made so that those who want copies can order them.

Judging from the progress that has been made in the past few years, here is one market that seems certain to chew up huge tonnages of aluminum. The railroads are becoming deeply interested in aluminum, and the field is wide open for the enterprising aluminum fabricator who can come up with a more efficient component that will help the roads save money.

High Purity Aluminum

Sirs:

We can't locate the recent issue of MODERN METALS that featured either an article or an advertisement on high purity aluminum—but it was probably an advertisement.

Please advise.

"M"—California

MM—The most recent was a story on Aluminum Foils, Inc., Jackson, Tenn. The firm, which has tripled its output, is the largest U. S. producer of high purity aluminum in billet, foil, pig, pellets, and coiled sheet.

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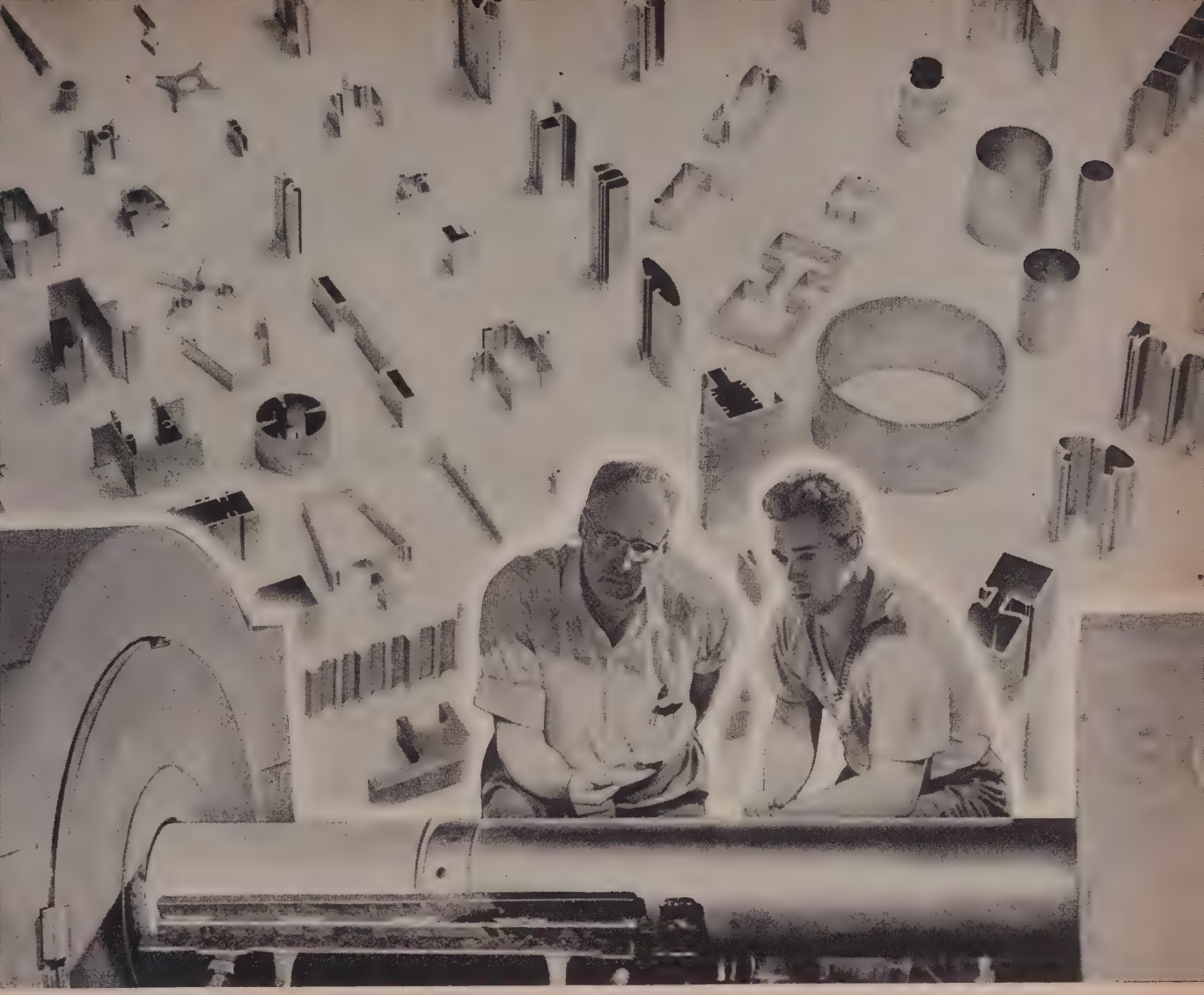

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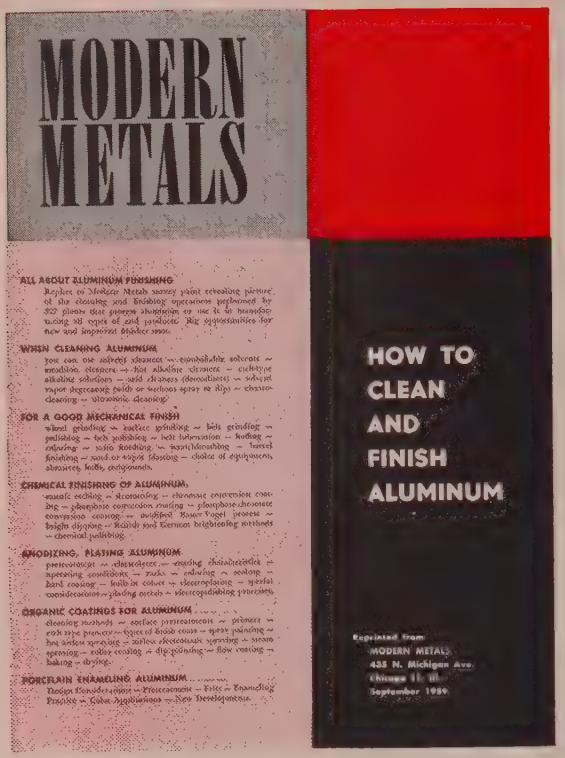
MODERN METALS
HOW TO CLEAN AND FINISH ALUMINUM
Reprinted from MODERN METALS 435 N. Michigan Ave. Chicago 11, Ill. September 1959

Single copies of this valuable reprint are now available at $1.00; from 6 to 25 copies, 75c each; for quantities over 25, 50c each. To order, simply fill in the form below and mail it, with payment, to . . .

MODERN METALS

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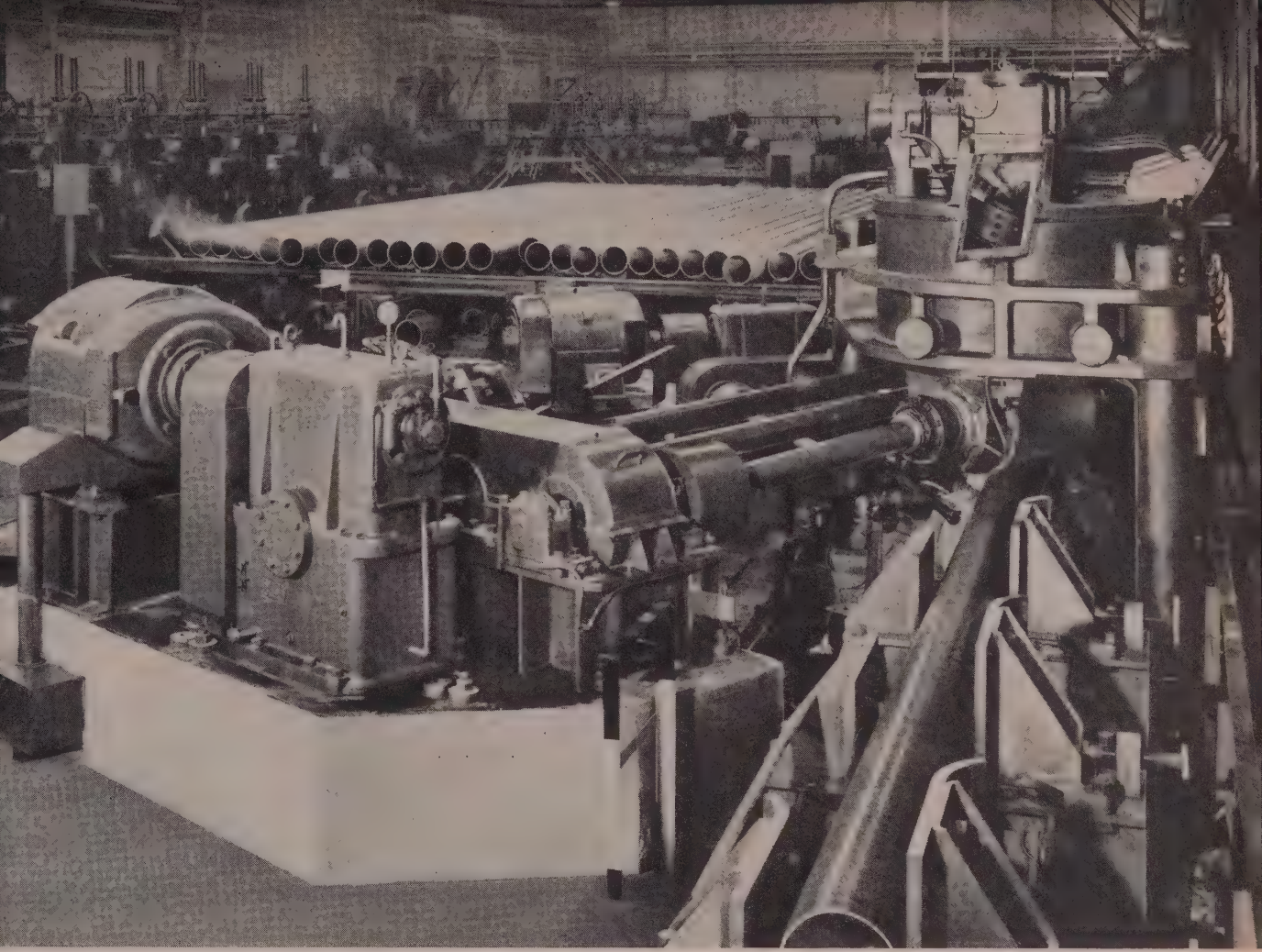
7-60

Here and There

Juicy Market for Sheet » » The many years of intensive wooing of the canning industry show signs of paying off for aluminum producers. Reynolds Metals, at least, seems to be scoring some modest success, having closed a deal to supply can parts for nearly all of the standard 6-ounce containers to be used next year at the Auburndale, Fla., plant of Minute Maid Corp. An estimated 50 million aluminum cans will be used for this plant's 1960-61 pack of juice concentrates sold under the Minute Maid and Snow Crop labels. The can, a conventional 3-piece job, will go through the filling line at a 650-per-minute clip. Big reason for using aluminum: Savings in freight. According to David P. Reynolds, executive vice president in charge of sales for the aluminum producer, a concentrate packer can realize a freight saving of one dollar per thousand cans by switching from tinplate to aluminum — in national distribution. The amount of aluminum involved in this one job is less than sensational — perhaps 1.6 million pounds if you figure roughly half an ounce per can. But the entire concentrate industry sold nearly 1.6 billion 6-ounce cans of frozen citrus juice in its 1959-60 season. That would be a market for almost 25,000 tons of aluminum sheet. We hear predictions that as much as 90% of the coming crop of citrus juice will go to market in aluminum cans. A juicy market for aluminum sheet.

Yearly Models Out? » » Last month this column commented on the decision of Kelvinator (American Motors' appliance division) to do away with the so-called annual models, and concentrate on genuine engineering improvements. Seems that AM's president, George Romney, considers the consumer smart enough to distinguish between basic improvements and superficial "face lifting" that has come to characterize the "new" appliance models. He thinks this approach will sell more appliances. Now we hear that some auto men are thinking along the same lines. Next year's compact cars, for example, will look substantially the same as this year's. Beginning next year, auto makers will pay more attention to functional changes — stress economy, safety, comfort, and the likes instead of appearance. A whole new market concept is brewing in Detroit, and the market is up for grabs as far as materials are concerned. If aluminum proves to be the best material for engines or brakes or bumpers or even body panels, it will probably get the nod. George Herrman, Alcoa's manager of transportation sales, thinks all cars will be powered by aluminum engines by 1970. And by 1975, each "family transportation unit" will contain well over 500 pounds of aluminum. By then, he figures, the family buggy will be riding on a cushion of air instead of wheels. (Getting back to earth, you'll find the views of auto makers in Part 3 of our Aluminum Hearings report, starting on page 62.)

Look Out for Mag » » The aluminum producers will have to reckon with magnesium in the auto busi-



How to straighten the really big pipe!

One major Eastern steel producer has found the answer – the big Mack-Hemp Model A-5 Straightener shown above—the largest of its type in the world!

This A-5 takes really big bowed pipe from the sizing mill, pulls it in through three pairs of opposed cross rolls and then spins it out straight and round to high tolerances in only a single pass.

This despite the fact that the steel pipe being straightened is 16-inch in diameter, fifty feet in length!

To do a job like this, of course, the massive 85-ton roll frame is a must, as are the heavy duty rolls, and the combined 200 HP motors used to drive all six of them. In its first year, this Mack-Hemp A-5 straightener has handled more than 200,000 tons of pipe.

If straightening pipe or tubing is your problem – any size, any alloy – consider doing it yourself. The men from Mack-Hemp will be glad to give you all the facts you'll want to know.

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ness, if Dow Chemical Co. has anything to say about it. This fall, Dow will open its $400,000 "customer service" laboratory, equipped to show auto makers and other customers what can be done with magnesium die castings. Facilities will include a 1500-ton die casting machine and a 500-tonner. The larger machine will produce castings weighing up to 20 pounds. Dow figures the machine will cast some parts "at twice the rate possible with directly competitive materials" — meaning aluminum. The secret: An automatic metering device takes advantage of magnesium's much faster rate of solidification. Incidentally, some auto men are scheduled to speak at this year's Magnesium Association meeting, to be held October 17-19 in Cleveland. On hand will be representatives of the Chevrolet and A-C Sparkplug divisions of General Motors. Other talks will be given by men from General Electric's Materials and Space Vehicle Dept.; Tote Systems, Inc.; Turco Products Corp.; Magnesium Elektron Ltd.; Lockheed Aircraft; Zero Mfg. Co.; The Martin Co.; H & S Metal Products; Sylvania Electric; Grumman Aircraft; Marquardt Aircraft; Raytheon Corp.; Dow Metal Products; and Hughes Aircraft. Theme of this year's meeting — "Blueprint for Magnesium" — emphasizes the applications "which hold the greatest promise as major potential markets in the next few years," says Association president, Otis Grant.

Auto Payola » » Have General Motors and Ford really been holding an umbrella over Chrysler in recent years? Detroit auto men are beginning to ask this, plus a second question: How long can GM afford to hold back on radical new designs just to keep Chrysler in the swim? To be sure, GM has reason to fear anti-trust action because it is the only company in a major industry that could stamp out all competition. Years ago when Ford was trying to reorganize and get going again, one got the impression that GM didn't press too hard — particularly with its Chevrolet Division. And when Chrysler started having design problems five years ago, the other two appeared to hold back on major design changes. Then along came American Motors with its little job, and jarred hell out of the market planning — and profits this year — of all three. The industry may soon be known as the Big Four, if Rambler's success continues. All of this leads to speculation as to why Chrysler ex-president William Newberg was suddenly dumped for having an interest in vendor companies. The auto industry has some secrets, but supplier kickbacks isn't one of them. As one old-time supplier puts it: "There was a time when you sold such things as pistons, castings, and trim best if you knew the 'right address.'" When old Henry Ford was at the helm one had to know the underlings *well* to do business in Dearborn — and elsewhere in the Detroit area. We've heard plenty about many an auto company over the years but never any payola talk about GM. Maybe that's why they've been so successful.

Not-So-Mobile Homes » » The dynamics of the mobile home business seem to be moving some of these companies in a surprising direction — toward the manufacture of permanent homes. Still too new to be called a trend, the evidence is strong enough to suggest another growth channel for aluminum in the building field. Not that Guerdon Industries, Marlette, Mich., would desert the mobile home business for one of prefabricated parts. This company is reported to be perfecting a "ready-built" 20 by 48 foot house, built in two halves for convenient over-the-road delivery. When the two halves are placed on a foundation and joined, the owner has a permanent home which theoretically can be cut in half again whenever he wants to move it. Midwest Homes, Carlisle, Ind., is another mobile home firm reportedly experimenting along these lines. It's working on an aluminum cottage, cleverly designed to look as though it's made of wood. These developments look like interesting possibilities for the mobile homes industry — which seems to be really on the move these days.

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Useful Data

Designing for Alloy Preforms by Lucas-Milhaupt devotes considerable space to aluminum brazing preform processes. Also included are comparisons of preform versus hand feeding; the applications of round, flat and mandrel wire and no-tangle notch-coil rings. Material selection chart shows various aluminum, gold, silver and soft solder alloys. For copy write H. H. Olson, Lucas-Milhaupt Engineering Co., 5040 S. Lake Drive, Cudahy, Wis.

Adhesives, coatings and sealers of 3M are covered in catalog Z-SIDF-60. Typical applications and design drawings are given for oil soluble, and oil resistant elastomers, structural adhesives, coatings, sealers. Composition of materials and useful temperature range are listed. Drawings show joint design for various jobs. For copy write E. F. Hess, Minnesota Mining & Mfg. Co., Adhesives, Coatings and Sealers Div'n, 900 Bush Ave., St. Paul 6, Minn.

Forging of various metals is detailed and many forgings are pictured in 32-page Titan manual. Special section covers properties of aluminum forging alloys. Also included are: Dies; how forgings are made; forging types; tolerance table; design factors; aluminum hot-pressed forgings; forging terms. Book can be obtained from M. J. Mianulli, Titan Metal Mfg. Co., Bellefonte, Pa.

Forged disc wheels of aluminum are detailed in a six-page brochure by Alcoa. Data on extra payload, longer tire life and reduced maintenance costs are given. Some of the information is based on a survey of hundreds of truck operators, of whom 82% reported an increase in tire mileage with aluminum wheels. For copy write Aluminum Co. of America, Alcoa Building, Pittsburgh 19, Pa.

Stock and price catalog of A. M. Castle lists net prices, and cost of fabricating services for aluminum products. Technical data given includes: Mechanical and physical properties; fabrication data; federal specifications; corrosion and tolerance tables. Stock lists include all standard warehouse items and weight data. For copy contact Larry Hansen, A. M. Castle & Co., 3400 N. Wolf Rd., Franklin Park, Ill.

Plate saw for cutting large sheets and plates of aluminum and other nonferrous metals and hard-to-work materials is described in pamphlet by Oliver Machinery Co. Special sections detail the following for the No. 838 unit: Purpose; design; saw arbor; motors; feed method; tables; capacity; equipment; clamping mechanism. A record of test cuts is included. You can get copy by writing Jay Dykstra, 1001 Cold-Brook St. N.E., Oliver Machinery Co., Grand Rapids 2, Mich.

Forty wet blasting finishing operations are covered in bulletin 451-D by the Wheelabrator Corp. The wet blasting process can be used on various materials to

In metallurgical circles you're hearing more and more about EXOTICS . . . a mysterious group of super-alloys increasingly important in our search of outer space. Fundamental purpose of these unusual metals is *higher strength* at *elevated temperatures.* The variety of metals is increasing constantly, each with its own highly specialized characteristics. Contracts involving components for rockets, missiles and space-searching components will have increasing use for EXOTICS and SUPER ALLOYS in the months ahead.

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deburr finish permanent molds, prepare surfaces for plating, etc. Of special interest is a process for preparing aluminum for anodizing so machine and die marks, etc., are eliminated. Fully illustrated booklet can be obtained by writing A. E. Lenhard, Wheelabrator Corp., 852 S. Byrkit St., Mishawaka, Ind.

Permeable Thermogard insulating sleeves for casting, use of 5% titanium-aluminum as a grain refiner and hardener in casting, and a gas detector for molten aluminum operations are discussed in data sheets prepared by Exomet Inc. One sheet tells how Thermogard sleeves can be used as blind risers, what alloys they can be used with, size of sleeve to use, and other operational details. Another sheet tells the function and other facts for the use of titanium in molten aluminum. A third sheet details 14 steps in the use of the gas detector. For copies write Donald Wyman, Exomet Inc., Conneaut, Ohio.

Gas fired industrial furnaces are subject of bulletin 106A by Ajax-Barkling. Dimensions and other data on firm's entire line of furnaces are given, and units are illustrated. Included are furnaces for melting aluminum; all purpose furnaces with operating temperatures from 800°F to 2400°F, and laboratory and school designs. Copy can be obtained from O. Haseltine, Ajax Electric Co., Frankford at Delaware Ave., Philadelphia 23, Pa.

Architectural components made of Revere aluminum are detailed in illustrated catalog. Covered are: Finishes; standard shapes; entrances, store fronts; door jambs; window sills; railings; thresholds; sheet (plain, embossed); roofing; siding; valley roll; alloy characteristics; technical advisory service. This 28-page booklet is available from Dick Snively, Revere Copper & Brass Inc., 230 Park Ave., New York 17.

Airless spray system for applying paints, varnishes, lacquers, adhesives, dyes, etc., is subject of illustrated booklet by Nordson. How system works, special savings firm claims when system is used, and description of various parts of system are given. Fifteen special questions on airless spraying are answered. For copy write Hubert Von Dorster, Nordson Corp., Amherst, Ohio.

Magnesium alloy sheet and plate are discussed in bulletin 3356 by Brooks & Perkins. First section of book covers standard alloys and includes a table listing alloy, temper and federal or military specification; tooling, tread and foundry pattern plate; Boral and special alloys. Second section tells how firm has improved rolling mill processes, and how improved methods of handling are being used. A metal weight comparison chart (magnesium, aluminum, steel) closes the book. Firm has also issued a new price sheet on magnesium alloys. Copies of both can be obtained from Ralph Gillespie, Brooks & Perkins, Inc., 1950 W. Fort St., Detroit 16.

Magnesium, aluminum and other metal products and facilities to handle these metals are covered in Dow booklet. Four special work areas are covered: Die casting, extruding, rolling mill and fabricating

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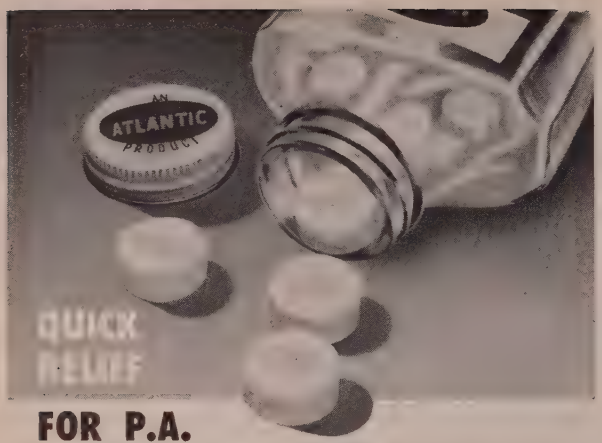

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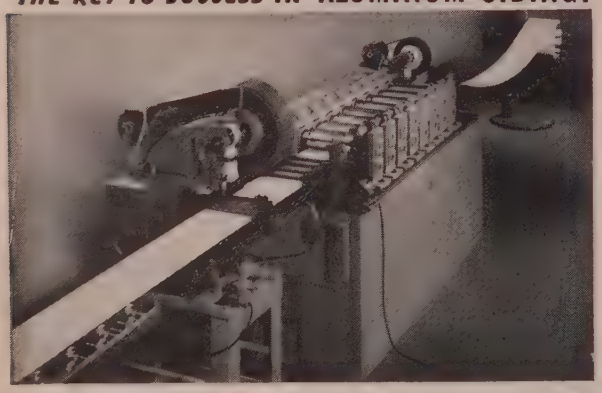

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plant. Three graphs are included to show how new alloys have extended magnesium's useful temperature range, and six tables give data on magnesium casting and extrusion alloys and other information. For copy write William H. Gross, Dow Metal Products Co., Hopkins Building, Midland, Mich.

Aluminum entrances and other building components are fully discussed and illustrated in a new catalog by American Art Metals. Special sections cover standard entrances; panic hardware; automatic door operator; optional door models; frame selection, and optional equipment. All sections include diagrams of installations. Other sections give specifications for curtain walls, and extrusion profiles. Catalog can be obtained by writing Willis Mozley, American Art Metals Co., P.O. Box 7188 Station C, Atlanta 9, Ga.

Air processing, and how it can be applied to the production requirements of many industries, is covered in bulletin S-5 by Ross Engineering. Included in illustrated book are discussions of ovens; strip coating line; coater-dryer lines; air heaters, etc. Technical data is given for all units. Six specific problems which were overcome by Ross machinery are detailed. For copy write Robert Hentschel, J. O. Ross Engineering, Div'n of Midland-Ross Corp., 730 Third Ave., New York 17.

Low cost tooling with standard industrial power tools is discussed in latest Delta case book. It contains 65 illustrated case histories telling how tools are combined to automate operation, increase production, improve quality, and perform operations usually done by expensive special equipment. Five sections cover single-spindle drill presses; multiple spindle drill presses; automated drill press set-ups; and dimensional data of company tools. Copies can be had from Joseph Mark, Delta Power Tool Div'n, Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.

Coatings selector is a guide to the selection of specialty coatings available for use on metals, plastics, wood and glass. The charts, which can be mounted, show the uses and characteristics of spray, dip and flow coating materials, vacuum metallizing coatings and standard plastisol formulations. For copy contact M. A. Self, Bee Chemical Co., Logo Div'n, 12933 S. Stony Island, Chicago 33.

Aluminum and steel flooring and stair tread are illustrated and described in 12-page Ryerson bulletin 50-9. Both solid and open types are covered, in a number of patterns and openings including material with slip-resistant surface. Plate and panel sizes, tables of safe loads, and design, specification and installation data are included. Write R. L. Nordstrom, Joseph T. Ryerson & Son, Inc., Box 800-A, Chicago 80.

Emission spectrochemical instruments, their basic principles of operation and typical applications, are briefly described in Baird-Atomic booklet. Included is discussion of a complete 3-meter grating spectrographic laboratory, direct-reading spectrometers, and the research direct reading spectrograph. For copy, write Charles Russell, Emission Sales Dept., Baird-Atomic Inc., 33 University Rd., Cambridge 38, Mass.

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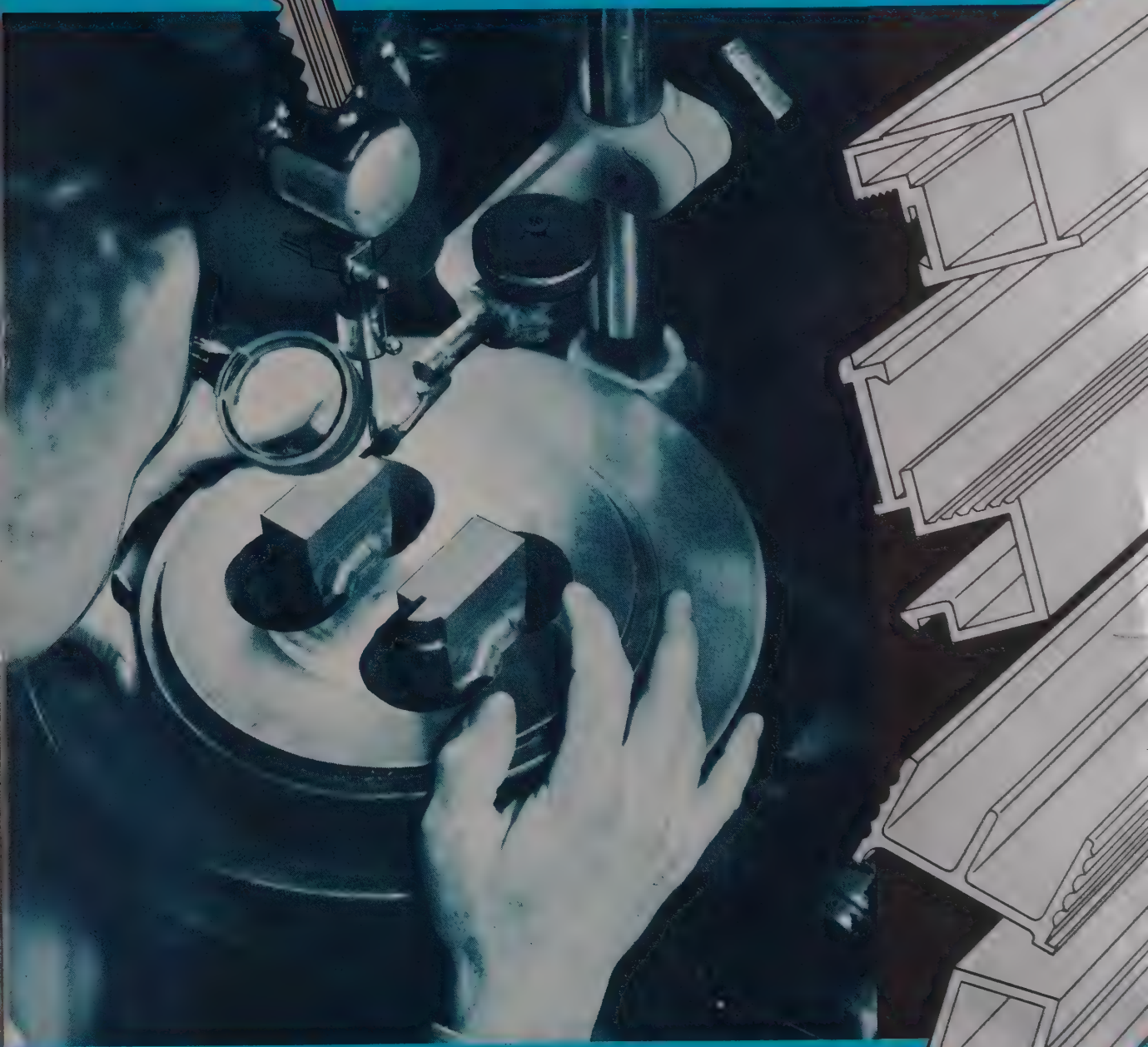

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Aluminum extrusions are used in the manufacture of **decorative columns** and railings by Douglas Co., 572 El Camino, San Carlos, Calif. The swirling scrolls and straight lines of the columns are anodized to withstand sea air, smog or atmospheric weathering. The easily installed products come in standard and non-standard sizes.

Aluminum plate, welding wire and rivets were used to build a special **excavating dipper** for use at Alcoa's Dominican Republic bauxite mining operations. Electric Steel Foundry Co., Danville, Ill., built the unit which holds 5½ cubic yards. A steel unit of the same weight would hold 4½ cubic yards.

Stressed skin aluminum **geodesic domes** will be fabricated, erected and sold in five midwestern states by R. C. Mahon Co., Detroit, under a franchise agreement with Kaiser Aluminum. The domes, which require no internal supports, are used for exhibition halls, gymnasiums, etc. The five states include Michigan, Ohio, Kentucky, Indiana and northern Illinois.

Vertical siding has been added to the residential siding line of Aluminum Co. of America. New siding comes in dark and light green, maroon, white and gray. It has vertical trapezoidal corrugations at 12 inch intervals. As with other Alcoa siding, the new siding will be sold through dealers of Barrett Div'n, Allied Chemical Corp.; Bird & Son, Inc.; Flintkote Co.; Mastic Corp.; Philip Carey Mfg. Co.

A completely-assembled aluminum **door unit** is being manufactured by Manitou Mfg. Co., 5723 Green Ash St., Houston 36, Tex. The unit consists of door frame, threshold, inside trim, weatherstrip, pin tumbler lock, nailing flanges and masonry clips. A pre-hung aluminum combination storm and screen door can also be had with the unit.

A $400,000 loan has been approved by the Development Loan Fund for privately-owned Societe pour L'Industrie des Metaux, S. A., so it can enlarge its fabricating facilities in Beirut, Lebanon. Present plans are to add **extrusions** to current line of sheet and circles. A hydraulic extrusion press and other equipment will be purchased and new working space built. All equipment will be bought from U. S. manufacturers.

An open house held recently by Ducommun Metals & Supply Co. celebrated the formal opening of its enlarged metals **service center** at 2550 Seventh St., Berkeley, Calif. More than $1.5 million were spent on new processing equipment and additional space.

Service cover to keep foods warm when served in mass feeding operations has a see-through plastic face

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(in several standard models) flatten steel, aluminum, brass and copper in widths up to 60" . . . in gauges .010 to .125! Your fabricating capacity and efficiency are increased *immediately!* Safe, one-man operation is simple and accurate.

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set in an aluminum frame. Frames come in several finishes and have indented tops for stacking. Cover is made by Zoia Banquetier Co., Inc., 4125 Payne Ave., Cleveland 3.

Exit lights with all-aluminum exteriors and shock-resistant glass faces are being made by The Kirlin Co., 3435 E. Jefferson Ave., Detroit 7. Units can be wired for incandescent or fluorescent lighting.

Counter-stools for restaurants have one-piece aluminum bases with a choice of upholstered seats and backs when made by the L & B Products Corp., 189 Huguenot St., New Rochelle, N. Y.

Bright natural and gold anodized finishes can be had on pebble-grained aluminum **trays** for displaying cookies, pastries, confections, etc. Trays are made by Allied Metal Spinning Corp., 808 Cauldwell Ave., Bronx 56, N. Y., in nine sizes ranging from 8 by 12 inches to 12 by 18 inches.

A bolted-aluminum frame in a gold anodized, copper, ebony or natural finish supports **dining-lounge chair** of low-slung, armless design. The Gasser Chair Co. makes them at 4136 Logan Ave., Youngstown, Ohio.

Portable steps are framed with square 1-inch aluminum tubing and steps are covered with rubber tread for safety. Winfield Co., 1301 Third St. S., St. Petersburg, Fla., makes a two and a three step model.

Safe end economical chain **fire escapes** for individual rooms in multistory buildings are being made of aluminum by Marryatt, Lane & Co., Inc., Fort Lee, N. J. A chain ladder is housed in a container fastened under a window. When needed, two sliding pins are removed and the container is lifted over the sill to become a platform complete with safety rails. The ladder hooks to a brace on the ground for steadiness. Platform and rails are made of aluminum with tread plate used for safety. Unit is called Marlan Emergency Fire Escape.

Tallman aluminum **ladders** aid fruit pickers and tree trimmers. Ladders have three legs so they can be set up in awkward places where there normally is no place to lean a ladder. Rungs and side rails are of aluminum sheet while the single outer support leg is drawn tube. They are made in 8, 10, 12 and 14-foot sizes by William Tallman, 817 Pine St., Hood River, Ore.

Removable cast aluminum **grease chute** is part of griddle unit which can handle 32 hamburgers at once. Unit has automatic temperature control and raised rims to prevent grease spillage. Gloekler-Meynell Corp., P.O. Box 1151, Erie, Pa., makes them.

An **all-purpose table** trimmed with aluminum is specially designed to fit over armchairs or at a bedside. Height is adjustable. American Hospital Supply Corp., 2020 Ridge Ave., Evanston, Ill., fabricates the units.

Three **garden tools** in one — rake, hoe, weed digger

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for the electrical industry

The shift in material specification within the electrical industry is to light, corrosion-free aluminum. For aluminum is proving to be the most efficient and economical material for the distribution of electricity and the manufacture and installation of electrical products.

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Harvey Aluminum manufactures aluminum rigid conduit marketed through established supply distributors.

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A major independent producer of quality aluminum in all alloys and sizes: Pig, ingot, billet, rod and bar, pipe, tube, hollow sections, press forgings, forging stock, hand forgings, impact extrusions, electrical bus bar, structurals, special shapes, light and heavy press extrusions, screw machine and other aluminum products. Related products in titanium, zirconium, and steel.

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Torrance, California

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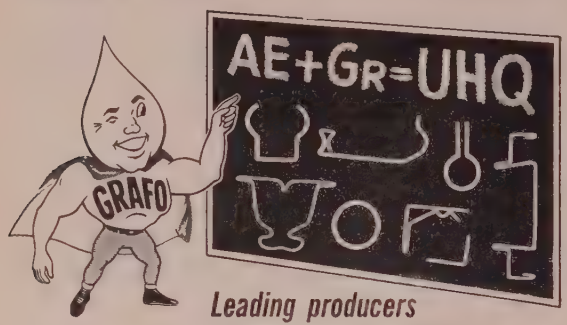

Leading producers of extrusions use GRAFO

Many manufacturers of aluminum extrusions already know the basic answer. It's simply this: *Aluminum Extruding* plus *GRAFO* equals *Uniformly High Quality!*

Why? Because GRAFO Colloidal Graphite dispersed in water reduces die wear, prevents sticking, gives better metal flow and improved production.

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We are now producing small quantities and small shapes (.1-lb. per foot or less) for three concerns with large presses. Experience has shown us that our two modern 520-ton presses can produce these shapes at far less cost than 1250-ton or larger units. So, if you operate a large press, call today and learn how we can produce small extrusions at real savings to you.

Jerry Settles
President

"You run the big shapes . . . we'll run the small"

MIDWEST
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— is made of aluminum by Dandy Products Corp., Oshkosh, Wis. It simply converts from hoe to weed digger and by pressing a button and pulling a trigger it becomes a rake that adjusts to any desired width from 6 to 13½ inches. It weighs less than two pounds.

Production of **super purity aluminum** is being tripled at Kaiser Aluminum & Chemical Corp.'s Mead, Wash., reduction plant with the installation of six new refining cells. Construction of the cells, said to be the largest of their type in the industry, is underway, with production expected to begin in September. Each cell will have an annual rated capacity of 360,000 pounds, making the plant's total capacity for super purity aluminum more than 3 million pounds a year.

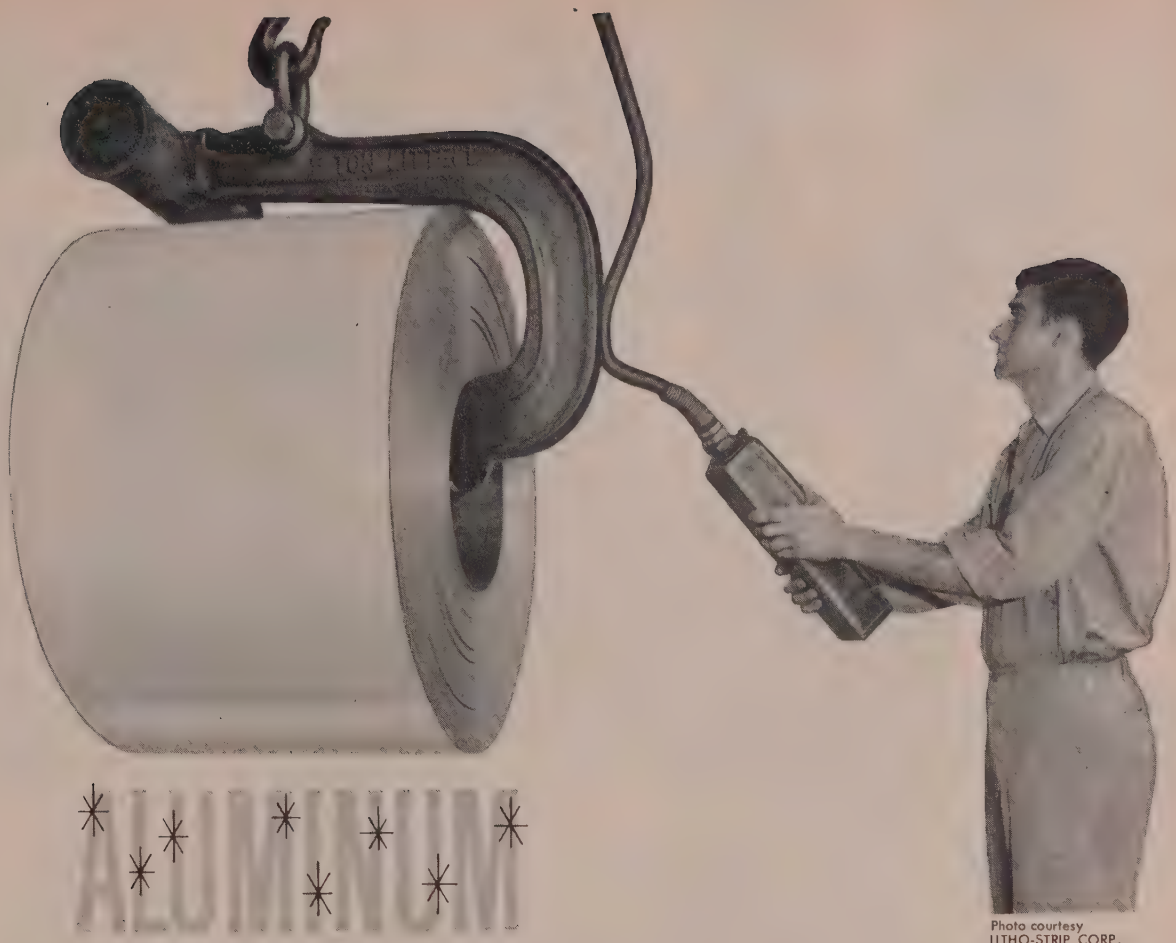
An expandable aluminum **parts truck** assures the high speed movement of vital replacement parts for ordnance and military equipment. Fabricated for the Army Engineer Corps by Southwest Truck Body Co., St. Louis, the truck trailers contain spare parts required for maintenance of remotely located army equipment. The trailer is 8 feet wide when in transit but can be opened to a 16-foot width. More than 900 pounds of aluminum is needed for each unit's body, roof and floor.

A **protractor** and an **aluminum angle plate** are new products of the K-M-P Tool Co., Lay-Out Engineers, 321 Highland Ave., Beloit, Wis. The protractor is adaptable to various sizes of slots (from ⅜ to 1-1/16-inch) and interchangeable to inspection tables, planers, mills, bars, etc. The firm says when it is used with the angle plate lay-out times are reduced 50%. Accuracy is guaranteed to within 5 minutes of a degree.

A translucent **fiberglass** rib panel (2.67-inch) for use in side- and skylighting in conjunction with wider metal sheeting, has been developed by Filon Plastics Corp., 333 N. Van Ness Ave., Hawthorne, Calif. The new panel has the same 48-inch net coverage width as — and nests perfectly with — Kaiser Diamond Rib and Alcoa 2.67 aluminum sheets. Filon's 6-ounce/square-foot panel, Type 180, has a finish width of 50¾ inches, comes in 96, 120 and 144-inch lengths, in clear or jade colors.

A new concept in aluminum **tank trailer** design increases strength and reduces overall weight says Trailmobile, Inc., Springfield, Mo. The firm's new tank trailer uses full length aluminum extrusions of the shell. The extrusions are said to increase tank strength 20% by eliminating cross welding needed in conventional trailer fabrication. Top extrusion serves as a non-skid walkway with integral flashing at the side. The bottom extrusion allows drainage through an uninterrupted channel.

Vertical-chain oiler has a horizontally mounted brush that spreads a thin film of oil on a working chain. The unit, made by Oil-Rite Corp., 2382 Waldo Blvd., Manitowoc, Wis., has an aluminum body. Brush sizes depend on chain, but come with ⅝, 1 and 1½ inch diameters. Manual or automatic oil dispensers can be used.



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Paint adhesion over the Bonderite coating is so strong that it permits the most severe forming operations without peeling or failure.

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OUTLOOK for Wrought Magnesium in Commercial Markets

Leading magnesium authority discusses technical and economic factors that will determine future growth of wrought mill products in commercial applications. Paper was delivered last May at a joint meeting of The Magnesium Industry Council of Great Britain and The Magnesium Association of the United States.

by Dr. J. D. Hanawalt, Vice President
The Dow Chemical Co., Midland, Mich.

SINCE the close of World War II the magnesium industry in the U.S. has tended more toward wrought products. In 1959 consumption of cast and wrought magnesium was practically equal (see Fig. 1) with castings slightly higher but on a downward trend.

Up to now, however, most magnesium castings in the U.S. have been produced by the sand process. An intensive development program is now underway to increase consumption of magnesium die and permanent mold castings.

Should this program succeed—and all indications are that it will—the growth curve for castings will climb steeply. And the favorable effect that this may have on primary metal pricing may well increase the growth rate of wrought magnesium also.

The peak year for wrought products was 1956, when 12,310 tons were consumed. Our estimate for 1959 is around 12,000 tons. Extrusions are considerably ahead of both rolled products and forgings. In 1956, extrusions accounted for 58% of the total, sheet and plate for 37%, and forgings for 5%.

Comparing military and commercial applications of wrought magnesium, there was a preponderance of commercial uses until World War II. From 1942 through 1944 all magnesium wrought products were allocated to defense. Commercial applications revived at a good rate in '45, and have continued to lead military since then, except in the Korean War year of 1952.

Extruded products predominate in consumption of magnesium wrought products in commercial uses (see Fig. 2). In 1959, the best year for commercial wrought products, extrusions accounted for 61% of the total, sheet and plate for virtually 39%.

The principal markets for commercial wrought products are plotted in Fig. 3. Consumer goods—including luggage, ladders and furniture—are the largest market and have demonstrated the most rapid growth. Next are industrial uses including machinery and tools, jigs, fixtures and dies fabricated from tooling plate, materials handling equipment, and foundry pattern plate.

Electrochemical applications—mostly extruded magnesium anodes — come next. Small tonnages are used in impact extruded battery cans. Finally, exhibiting slower growth rates, are the truck-trailer and graphic arts markets.

The graphic arts market built up rapidly until 1955 and '56, then started to decline. The growth was spurred by the Dow powderless etching process, developed specifically for magnesium. This process proved suitable for zinc, also, and many photoengravers switched back to zinc because of its lower price.

Shipments of wrought magnesium to commercial markets in 1959 were:

MARKET	TONS
Consumer products	2700
Dockboards & ramps	600
Other materials handling	375
Machinery & tools	575
Tooling plate	600
Truck & trailer	375
Business machines	125
Graphic arts	300
Electrochemical	1950
Miscellaneous	1000
Total	**8600**

Note that the general category of industrial uses is broken down into more specific applications such as dockboards and ramps, other materials handling, machinery and tools, and tooling plate (jigs, fixtures, dies).

It is risky to predict the future without the benefit of as-yet-unknown discoveries which may affect magnesium wrought products. At best, predictions are judgments and opinions based on present facts, not only for magnesium but also for its principal competitors.

While magnesium's immediate competitor in a specific field may be plastics, wood, zinc, iron or steel, we will simplify this discussion by comparing the properties, serviceability and costs of magnesium to those of aluminum. Most articles that can be made of magnesium can usually be made similarly of aluminum.

The designations, compositions, and typical mechanical properties of magnesium wrought alloys discussed below are given in Fig. 4 (page 36). Similar information for several aluminum wrought alloys is given in Fig. 5 (page 38).

The growth rate for wrought aluminum in the U.S. has been about 8% per year since 1945, and 8.5% per year since '51. For wrought magnesium the growth rate has been 9% per year since 1945, and 3% per year since '51.

The lower rate for the past eight years is a consequence of reduced military procurement. The growth rate for *commercial* wrought magnesium is 17% per year since '45 and 7% per year since 1951. This latter growth rate approaches that of aluminum since 1951 and is greater than the 5.5% per year for all durable goods in this period.

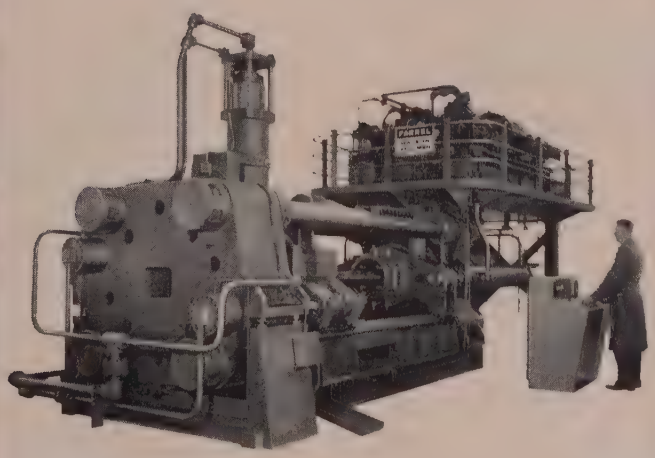
Despite progress in establishing a wrought magnesium industry, there is little room for complacency. At 12,000 tons, the 1959 volume of wrought magnesium was less than 1% of the wrought aluminum volume of 1,690,000 tons.

Since aluminum is heavily involved in all the markets that represent the major structural applications of magnesium, the latter must face comparison with aluminum and will obtain only that share of the business for which the comparison is in its favor.

In many fields where wrought aluminum has carved out broad markets —electrical and packaging, for example —magnesium does not offer advantages when compared to aluminum. Magnesium has found its markets primarily where weight saving is valuable, as in

extrusion presses for any purpose—

2100-ton lead press for cable covering and rubber-hose vulcanizing.



2200-ton aluminum-extrusion press.

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The Farrel Watson-Stillman line of extrusion presses is as broad as your requirements. And, designs are based on 100 years of experience in building hydraulic equipment tailored to individual needs.

Company engineers have helped hundreds of manufacturers to find the right equipment for a specific job . . . to raise efficiency, boost production rates and increase profits. They are ready to start work on your problem today.

Ask for a quotation on a press for extruding any of the metals or materials listed below. Capacities range up to 6,000 tons in standard or special designs.

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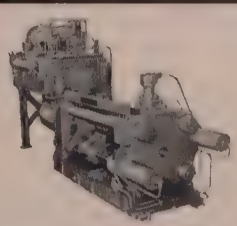
aluminum • brass • bronze • carbon • ceramics • copper cordite • crayon • graphite lead • lead pipe • magnesium phosphor bronze • silver alloys and precious metals • solder welding rod • wire and special alloys

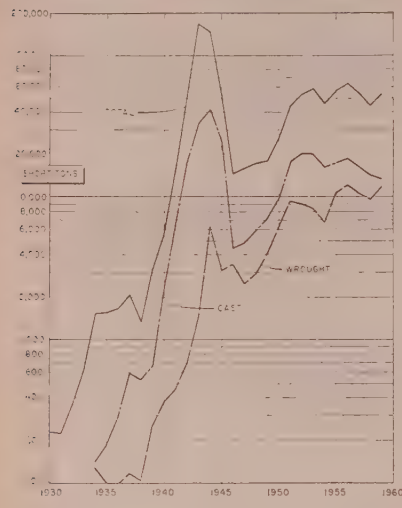


600-ton phosphor-bronze and silver-alloy press.

300-ton carbon-extrusion press.

WS-75

Fig. 1: Total U.S. Magnesium Consumption, Cast & Wrought



industrial and consumer goods which must be handled, and in transportation.

(The magnitude of the transportation market is indicated by its use of 500,000 tons of wrought aluminum in 1959. It has been predicted that this volume may be doubled by 1970.)

The prospects for continued or accelerated growth in these areas will depend mainly on the degree to which magnesium can improve its position with respect to relative weight and cost of the finished structural part as compared with aluminum.

The relative mechanical properties of magnesium and aluminum are a strong factor in the relative weights of structural parts fabricated from the two metals. This is borne out by comparing the consumption figures for magnesium castings and wrought products.

Historically, magnesium sand castings have been in a considerably better position with respect to aluminum's mechanical properties than magnesium wrought products have been. Despite the high cost of magnesium sand castings, they have been used extensively in aircraft engines and wheels because they save considerable weight compared to aluminum castings.

Sand Castings Sell Well

With their inherently fine grain and consequently high relative properties, magnesium sand castings shipments amounted to 8.6% of the aluminum sand casting volume in 1959 and 17.5% in 1944. In contrast, wrought magnesium shipments amounted to 0.7% of the wrought aluminum volume in 1959.

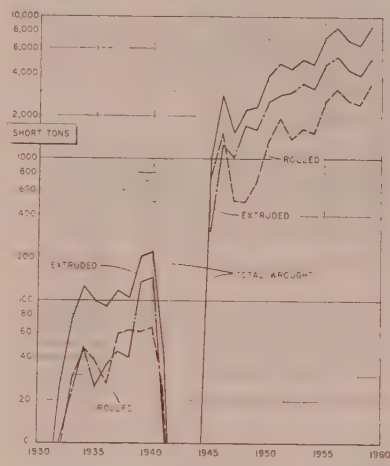
The favorable strength and creep properties of the magnesium-thorium and magnesium-rare earth alloys at temperatures in the range of 600°F. are significant because of the opportunity to save considerable weight of a similar part in aluminum.

Thorium and rare earth metals are expensive, however, and applications of these alloys are limited mainly to uses in supersonic aircraft and missiles. Commercial uses in such products as forged engine pistons and aircraft wheels (where brake temperatures are excessive) could occur in the future.

Comparing properties at room temperature, it is evident that under several conditions magnesium sheet, extrusions and forgings cannot replace aluminum at equal gauge or section. A unit volume of magnesium cannot perform the same mechanical or structural service as a unit volume of aluminum.

For axial tension loading, or for any design in which the structure can be fabricated to the design allowables of the material, the high-strength aluminum alloys provide a higher strength-to-weight ratio than do any of

Fig. 2: Commercial Wrought Magnesium Shipments (U.S.)



the magnesium alloys. Since many airframe components, for example, can be designed to the allowables of material, they are built in aluminum.

In many other cases, however, different conditions determine the limiting design criteria — such as stiffness, beam strength, or elastic instability of a plate or column. Properties of such structures are proportional to the cube or the square of the cross-section so that the lower properties of magnesium can be compensated for by a 15 to 25% increase in sheet gauge or cross-section of extrusion while retaining a 17 to 22% weight saving with respect to aluminum.

For a bending fatigue application in which stress at the surface initiates failure, the surface stress is inversely proportional to the square of the section thickness. This introduces the possibility of using an extra volume of magnesium to obtain superior fatigue strength or life while still maintaining a weight saving of 20% or more, compared to aluminum.

Favorable in Fatigue

The subject of fatigue properties is complicated. It is difficult to draw practical conclusions from existing data because of the many undefined factors, such as surface conditions, stress concentrations, corrosive effects, type of cyclic stresses, "r" values, etc. However, in service, magnesium's fatigue strength allows it to save weight compared with aluminum.

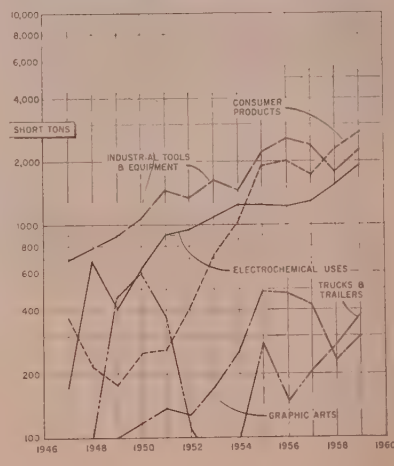
There exists a great deal of experience on this in cast aircraft wheels and engine parts. Important examples of wrought magnesium include forged magnesium engine mounts used on practically all German airplanes in World War II, and the present extensive use of large magnesium forgings in American helicopters.

Direct comparisons of magnesium and aluminum full-scale components are not available, although some programs of this type are underway. They confirm that substantial weight saving is possible with wrought magnesium. More studies of many types of parts are needed to complete such a program.

In simple test bar studies magnesium fatigue strength generally does not drop off as rapidly for increasing values of "n" (number of cycles of repeated stress) as shown in Fig. 6 (page 40). Thus, the ratio of fatigue strengths and of yield strengths for aluminum vs. magnesium is larger at low "n" than the ratio for higher values of "n."

This fact becomes of practical significance in structures which are designed to stresses close to the yield strength—for example, a road vehicle as contrasted to an aircraft frame which must have a safety factor of several G's or more. The floor of a trailer may

Fig. 3: Commercial Markets Of Wrought Magnesium (U.S.)



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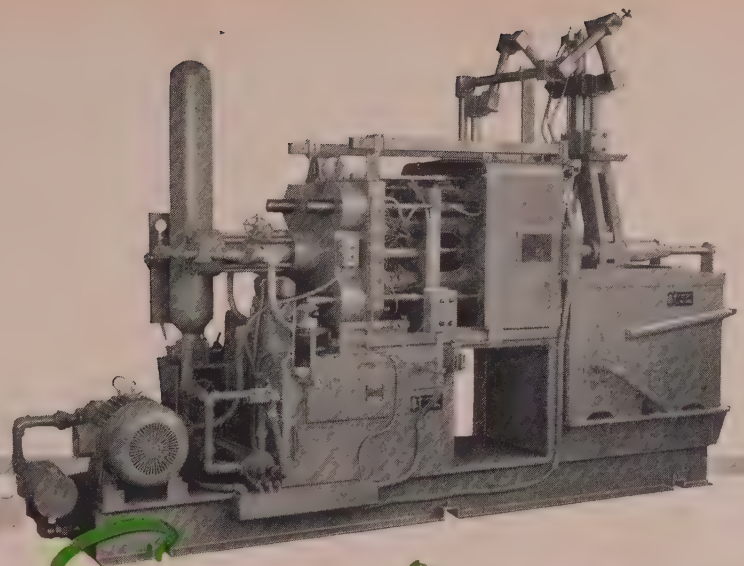

Experience

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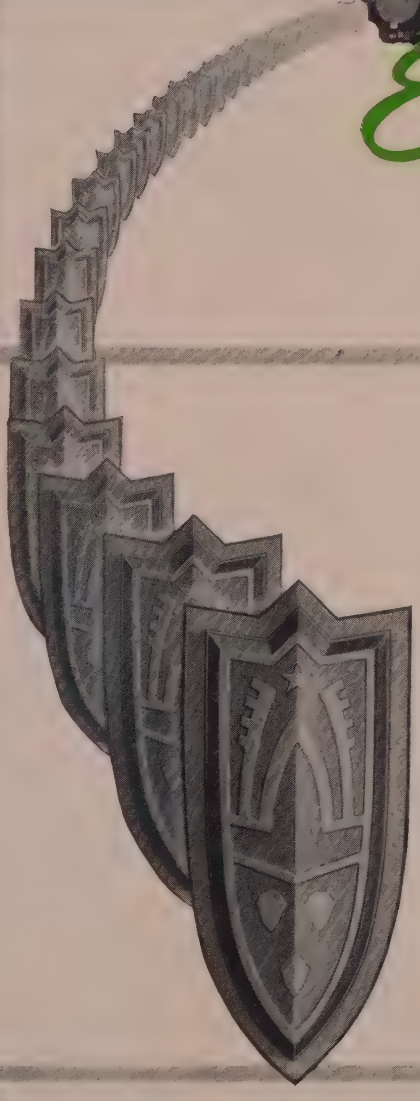

For more than 50 years Greenlee Bros. & Co. has dealt with the complexities of volume production. Greenlee is known as one of the pioneers in the field of high production machines. It is one of the most respected suppliers to the metalworking industry. Greenlee-B&T Die Casting Machines, built for automatic or semi-automatic operation, enable you to meet the relentless pressures for increased production and reduced costs. If your manufacturing requirements call for fine-finish, high-density die castings in volume quantities then write or phone for complete information.

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B&T MACHINERY COMPANY
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have to sustain 50,000 trips of a five-ton forklift truck in its lifetime.

For static loading the floor beam design in 6062 aluminum vs. AZ31 magnesium would have to consider the ratio of yield strengths. For dynamic design, however, the designer should consider the ratio of fatigue strengths at $n = 50{,}000$, which ratio is a substantially lower figure.

As noted, for structures involving bending fatigue in which the critical stress is at the surface, the stress is inversely proportional to the square of the thickness of the panel. The stresses to initiate fatigue failure at the surface of a panel 15% thicker, for example, would be reduced about 25%.

This is why a magnesium auto wheel, for example, which has twice the section thicknesses of the same design in steel (and therefore only half the weight) will match or exceed the fatigue life of the steel wheel, even though the test bar fatigue strength of the magnesium is only one-fourth that of the steel.

A practical consequence of magnesium's lower modulus of elasticity, as compared to aluminum, is the capacity to absorb more energy elastically for alloys which have approximately the same yield strengths. This can be measured in terms of the energy of impact which can be absorbed by a panel without sustaining substantial permanent deformation.

Dent Tests for Luggage

This type of test was carried out by a luggage manufacturer to compare the dent resistance of various magnesium alloys and aluminum alloys. In a test conducted on 0.040 inch sheets, the magnesium and aluminum were comparable in dent resistance. If the magnesium panel is, for example, 15% thicker then, even though about 22% lighter, it is more dent resistant because of the lower modulus and the larger volume of metal.

It does not follow that the energy to rupture is greater, since this is measured by the total area under the stress strain curve and not by the area under the elastic portion. In total energy to rupture aluminum alloys are superior.

Various important advantages accrue as the thickness of a panel is increased. Stiffness is proportional to Et^3 so that a 15% increase in thickness gives the same rigidity to a magnesium panel with a modulus of 6.5×10^6 as that of an aluminum panel with a modulus of 10.5×10^6.

Thus, an increase in section of a magnesium component soon makes up for the lower properties of magnesium as compared to aluminum in many types of practical structures which are not designed to the axial tensile strength of aluminum. Comparative strength and stiffness in bending of

Fig. 4: Composition and Typical Properties of Magnesium Wrought Alloys

ALLOY TYPE	DESIGNATION, FORM (U. K.. EQUIVALENT)		NOMINAL COMPOSITION, %							TEMPER	PROPERTIES, KSI			
			Al	Zn	Mn	Zr	RE	Th	Ca		%E	TYS	CYS	TS
Manganese-Containing	MIA,	extrusion			1.2 Min				0.11	-F	6	27	10	42
	(AM503)	forging								-F	6	19	14	33
Aluminum-Containing	AZ10X2,	extrusion	1.0	0.4	0.15 Max				0.04 Max	-F	10	26	10	36
	AZ31B,	sheet	3.0	1.0	0.20 Min				0.04 Max	-H24	15	32	26	42
	(AZ31)	extrusion								-F	15	29	14	38
		forging								-F	9	28	12	38
	AZ61A,	extrusion	6.0	1.0	0.15 Min					-F	16	33	19	45
	(AZM)	forging								-F	12	26	17	43
	AZ8OA,	extrusion	8.0	0.5	0.15 Min					-T5	8	38	34	55
	(AZ855)	forging								-T5	6	34	28	50
Zirconium-Containing	ZK21A,	extrusion		2.3		0.6				-F	10	33	25	42
	(ZW2)													
	ZK60A,	extrusion		5.5		0.45 Min				-T5	11	44	36	53
	(ZW6)	forging								-T5	13	38	28	49
	(P)ZK60B,	extrusion		5.8		0.45 Min				-T5	17	38	40	49
Rare-Earth-Containing	ZE10A,	sheet		1.2			0.17			-H24	12	28	26	38
	ZE41XA,	sheet		4.2		0.45 Min	0.6			-H24	14	34	30	42
		forging								-T5	10	39	23	46
	EK31XA,	forging				0.6	3.0			-T6	6	27	24	43
	(P)ZE62X1,	extrusion		5.7		0.6	1.8			-F	13	43	47	52
	HM21A,	sheet			0.8			2.0		-T8	10	21	15	34
		forging								-T5	3	31	21	35
	HM31A,	extrusion			1.2 Min			3.0		-F	10	33	25	42
	HK31A,	sheet				0.6		3.2		-H24	8	32	29	40
		forging								-T5	17	33	27	38

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some structural metals are given in Fig. 7 (see page 41).

In summary, then, a gauge for gauge substitution of magnesium for aluminum results in a structure which is not as strong or rigid statically or dynamically in magnesium as in aluminum, and so is not as serviceable unless the aluminum structure has been over-designed. (Over-design frequently is the case because of desired secondary structural properties, fabrication problems, appearance, and other factors.)

If the structure, as in many airframe components, can be designed to the axial strength of the metal, magnesium cannot save weight compared with aluminum. But if the design is determined by bending or instability or fabrication considerations, then increased section thickness of 15 to 20% in magnesium (if design permits), can provide a stronger, stiffer and more rugged and serviceable article both statically and dynamically and at a weight saving of about 20%.

How Much Can You Pay?

The factor of price is more important in commercial than in military applications. With many magnesium wrought products priced higher on a volume-equivalent basis than aluminum, the question for the prospective user of magnesium often becomes one of how large a premium can be afforded for light weight or the other advantages of magnesium.

It is pertinent, then, to examine the relative basic economics of magnesium and aluminum wrought products to determine the areas in which magnesium can meet the necessary cost requirements.

In sand casting technology, conversion costs for magnesium are greater than for aluminum because of extra requirements such as fluxes for melting, protective agents for sand, greater per cent of poured metal, larger volume of run-around metal, and greater melt loss.

Die Casting Favors Mag

In die casting, conversion costs favor magnesium when latest developments are utilized. Substantially the same equipment and scale of operation is used for both metals, but magnesium has the advantage of faster die casting rates and a greater degree of automation.

In discussing wrought metal conversion costs, I refer specifically to the Madison Plant of The Dow Metal Products Company. This plant is located close to the geographic center of the U. S., on the Mississippi River, so that primary magnesium metal can be received by barge directly from the sea-water extraction plant on the Gulf Coast of Texas.

The Madison facilities include melting and alloying equipment; direct-chill casting of extrusion billets up to 33 inches in diameter and rolling ingots up to 12 by 36 inches; extrusion presses ranging from 1700 to 13,200 tons; and 4-hi rolling mills from 16 inches to 84 inches wide, reversing breakdown, along with the usual auxiliary equipment.

Melting, alloying and refining of magnesium alloys is carried out mainly in gas-heated pots of 5000 pounds capacity. The monthly melt loss averages about 3.5% under normal operations and the usual range of alloys. This is somewhat greater than for the same operations in aluminum.

Casting is by continuous automatic units at rates ranging from two to five inches per minute, depending upon alloy and size of ingot. These rates, as well as sizes of extrusion and rolling ingots are comparable with aluminum practice. Scalping equipment and scalping losses are also comparable.

How Extrusions Compare

In extrusion operations, the same general principles apply to both metals. Speeds are limited by alloy content, section configuration, minimum section thickness, die design, grain structure and properties desired. When extruding aluminum alloys having small percentages of alloying constituents (1100 and 6063, for example) speeds are generally high—150 to 250 fpm.

Comparable speeds have been used on magnesium alloys AZ10XA and M1A. Alloys AZ31B and AZ31C extrude

Fig .5 Compositions and Mechanical Properties of Aluminum Alloys

Alloy	Aluminum Assoc. Designation & Form	Nominal Composition in %										Temper	Mechanical Properties KSI			
		Cu	Si	Mn	Mg	Zn	Ni	Cr	Pb	Li	Cd		%E	TYS	CYS	TS
Copper-Containing	2014, extruded	4.4	0.8	0.8	0.4							-T6	13	60	60	70
	X2020, all	4.5		0.5						1.1	0.2	-T6	6	79	79	87
	2024, all	4.5		0.6	1.5							-T4	20	47	47	68
	X2219, all	6.0		0.3								-T6	16	43	43	63
Manganese Containing	3003, all			1.2								-H18	4	27	27	29
Magnesium Containing	5052, rolled				2.5			0.25				-H38	7	37	37	42
	5083, all			0.8	4.45			0.10				-H113	16	33	33	46
	5456, all			0.8	5.25			0.10				-H321	16	37	37	51
Magnesium and Silicon Containing	6061, rolled	0.25	0.6		1.0			0.25				-T6	12	40	40	45
	6062, extruded	0.25	0.6		1.0			0.06				-T6	12	40	40	45
	6063, extruded		0.4		0.7							-T6	12	31	31	35
Zinc Containing	7075, rolled	1.6			2.5	5.6		0.30				-T6	11	73	73	83
	7075, extruded	1.6			2.5	5.6		0.30				-T6	11	80	80	91
	7178, rolled	2.0			2.7	6.8		0.30				-T6	10	78	78	88
	7178, extruded	2.0			2.7	6.8		0.30				-T6	10	86	86	97

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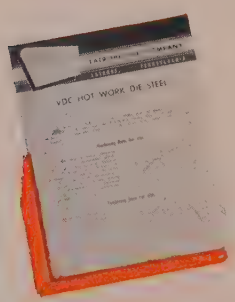

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Fig. 6 — Median Fatigue Strengths Of Some Magnesium and Aluminum Alloys

(in 1,000 psi at indicated number of cycles)

	10^5	10^6	10^7	10^8
Rotating Single Beam Specimens				
AZ31B-F extrusions	26	23	21	19
ZK60A-T5 extrusions	28	24	21	20
6061-T6 extrusions	31	23	17	15
2024-T4 extrusions	43	31	24	21
Flat Cantilever Specimens in Completely Reversed Flexure				
AZ31B-H24 sheet	22	18	16	15
6061-T6 sheet	30	22	16	13
2024-T3 sheet	34	26	21	18

at from 30 to 70 fpm. A medium-strength aluminum alloy, 6062, extrudes at 20 to 50 fpm.

As alloy content increases in aluminum alloys, much lower speeds are necessary to avoid surface tearing. With 7075, 7178, 7079 and similar alloys containing 5 to 6% zinc, speeds are limited to 1 to 5 fpm. Magnesium alloys with 6% zinc (ZK60A) will extrude at 6 to 9 fpm in sections up to two pounds per foot. In heavier sections, and if maximum properties are desired, speeds are limited to 3 to 5 fpm.

With present alloys, aluminum can be extruded with a somewhat higher ratio of speed to strength. Metal efficiency in the extrusion operation is in general as good or better for magnesium than aluminum.

Forging Technique Similar

The hydraulic press forging technologies of the two metals are also quite similar. Magnesium alloy AZ80A usually requires more operations than needed to produce the same forging in aluminum alloys 7075 and 7079. Alloy ZK60A, on the other hand, can frequently be forged with the same dies used for the strong aluminum alloys, including 2014, and with lower forging pressures.

For many years magnesium extrusions and forgings were produced by metalworking companies in Britain, the U.S., Germany and other countries on the same type of equipment used for aluminum, but the situation in rolled products was quite different. No markets for magnesium sheet could support or utilize a modern rolling mill.

During World War II the maximum production of magnesium sheet in Germany was about 700,000 pounds per month, rolled by three or four different companies and used almost entirely for aircraft. The rolling ingots weighed about 100 pounds, and ingots and sheets were manipulated by hand on slow 2-hi mills. Sheet cost was necessarily excessive, and only premium uses were considered. The same situation prevailed in the U.S. Clearly, the industry required a major technological advance.

In Rolling Mag Sheet . . .

Considerable doubt had been expressed that magnesium could be successfully adapted to modern high-speed coil rolling. To resolve this question, Dow conducted numerous preliminary investigations and in July 1946, demonstrated the continuous rolling of magnesium alloy AZ31B with the help of American Rolling Mill Co. at their mill in Butler, Pa.

Installation of the Madison rolling facilities was a large forward step for magnesium, but it did not result in a total catching-up with aluminum. We do not have the complete tandem lines that are rolling aluminum.

For coil or plate in gauges which can be produced on the breakdown mill, conversion costs are the same for magnesium and aluminum. Lighter gauges in magnesium require a succession of passes on a hot run-down mill with recoiling after each pass.

For example, the production of 0.040-inch coil in AZ31B-H24 alloy consists of rolling in one heat from 12-inch ingot to 0.180-inch sheet on the reversing breakdown mill. A succession of four passes on the hot run-down mill then reduces the coil to 0.040 inch. The coil is reheated between each pass and given a final stress anneal.

A likely schedule for 0.040-inch aluminum sheet in 5052-H32 alloy would be to reduce cold from 0.125 inch in three or four passes with one or two intermediate anneals and with final temper imparted by a stabilizing anneal.

The eventual installation of tandem mills will shift to the lighter gauges the point at which conversion costs are equalized with those of aluminum. In the American Rolling Mill Co. demonstration, the mills were 48 inches wide and consisted of a reversing breakdown mill followed by a four-stand tandem set of 4-hi mills and an upcoiler.

The 800-pound, seven-inch-thick rolling ingots were heated to 800°F. At speeds up to 635 fpm the rolling slabs were reduced to 0.400 inch in 17 passes and then transferred with no intermediate anneal to the tandem mill, from which the sheet emerged and was coiled in gauges down to 0.052 inch at final speeds up to 1245 fpm. Elapsed time for the whole operation was about four minutes.

In appraising potential commercial markets, one must consider the final product cost. The cost of a finished metal article is made up broadly of three parts: (1) The base metal cost; (2) the semi-stock conversion cost; and (3) shop costs such as forming, joining, machining, painting, etc.

Shop costs are comparable for magnesium and aluminum. Forming, when it can be done cold, favors aluminum. Machining favors magnesium. Argon arc welding is very practical for magnesium, and speed of welding and weld efficiencies are high. The new weldable 5000 series of aluminum alloys is an improvement for aluminum in this respect.

Painting and most finishing techniques are equally applicable to both metals. Of course, aluminum is specially favored when an unfinished or a decorative anodic finish is desired. However, an increasing number of protective and decorative finishes are being made available for magnesium.

Electronics Firm Says . . .

When compared with the activities of the many thousands of shops processing aluminum, experience with magnesium is relatively scant. But here and there can be found plants with considerable general shop experience with both metals. After more than 10 years of extensive fabrication of both aluminum and magnesium radar and other electronic housings, the superintendent of a major electronic equipment plant stated that the problems and costs of processing aluminum and magnesium in his shop were equivalent, with the exception that magnesium structures were easier to straighten after welding.

The superintendents of two plants making large welded bulk shipping containers and large welded tanks have recently added magnesium to their product lines. After making several hundred magnesium structures, each has stated that the fabrication costs in

their shops were no more for magnesium than for aluminum.

Because of the relative newness and lack of mass shop practice, much remains to be learned about magnesium. Very recently it was demonstrated that magnesium alloys such as AZ31B or ZE10A can be readily fabricated on mechanical presses operating at standard speeds.

There is much experience in magnesium aircraft and radar fabrications, but the volume is not large and the magnesium parts have been deep drawn on slow-acting hydraulic presses. The capacity of magnesium for deep draws of as much as 70% with the aid of graphite lubricant at high temperatures has been much publicized.

It came as something of a surprise that a draw of as much as 40% can be made with a cylindrical magnesium part on a mechanical press at 35 strokes per minute (50 feet per minute punch speed) at 400° F — a temperature sufficiently low that graphite lubricant, with its attendant removal cost, is not necessary.

Undoubtedly, more experience and more ingenuity applied to magnesium will demonstrate methods of further adapting magnesium to the practices applied to aluminum and steel.

Fig. 7: Comparative Strength and Stiffness in Bending of Some Structural Metals

COMPARISON		MATERIAL		THICKNESS	BENDING STRENGTH	STIFFNESS	WEIGHT
For Equal Thickness	Extrusions	6062-T6	aluminum	100	100	100	100
		2024-T4	aluminum	100	120	105	103
		7075-T6	aluminum	100	200	103	104
		AZ31B-F	magnesium	100	43	65	66
		ZK60A-T5	magnesium	100	93	65	68
	Sheet	6061-T6	aluminum	100	100	100	100
		2024-T4	aluminum	100	114	105	103
		7075-T6	aluminum	100	189	103	104
		AZ31B-H24	magnesium	100	75	65	66
		SAE 1025	steel	100	103	290	291
For Equal Strength	Extrusions	6062-T6	aluminum	100	100	100	100
		2024-T4	aluminum	91	100	80	94
		7075-T6	aluminum	71	100	36	73
		AZ31B-F	magnesium	150	100	220	98
		ZK60A-T5	magnesium	103	100	72	70
	Sheet	6061-T6	aluminum	100	100	100	100
		2024-T4	aluminum	94	100	85	96
		7075-T6	aluminum	73	100	40	76
		AZ31B-H24	magnesium	115	100	100	76
		SAE 1025	steel	99	100	278	287
For Equal Stiffness	Extrusions	6062-T6	aluminum	100	100	100	100
		2024-T4	aluminum	98	116	100	101
		7075-T6	aluminum	99	196	100	104
		AZ31B-F	magnesium	115	59	100	76
		ZK60A-T5	magnesium	115	125	100	78
	Sheet	6061-T6	aluminum	100	100	100	100
		2024-T4	aluminum	98	111	100	101
		7075-T6	aluminum	99	185	100	104
		AZ31B-H24	magnesium	115	100	100	76
		SAE 1025	steel	70	51	100	204
For Equal Weight	Extrusions	6062-T6	aluminum	100	100	100	100
		2024-T4	aluminum	98	114	97	100
		7075-T6	aluminum	96	186	92	100
		AZ31B-F	magnesium	152	103	231	100
		ZK60A-T5	magnesium	148	203	209	100
	Sheet	6061-T6	aluminum	100	100	100	100
		2024-T4	aluminum	98	109	97	100
		7075-T6	aluminum	96	176	92	100
		AZ31B-H24	magnesium	152	174	231	100
		SAE 1025	steel	34	12	12	100

(1) Rectangular beams of constant width with the following minimum yield strength:

6062 (extruded), 35 ksi; 2024 (extruded), 42 ksi; 7075 (extruded), 70 ksi; AZ31B (extruded), 15.5 ksi; ZK60A (extruded), 32.7 ksi; 6061 sheet, 35 ksi; 2024 sheet, 40 ksi; 7075 sheet, 66 ksi; AZ31B sheet, 26.2 ksi; SAE 1025 sheet, 36 ksi.

"Not one dime spent on Metal Products "for the Amchem-

CAMPCO's Executive Vice-President W. H. "Bill" Chapman sums it up—"Every time I turn around we save money in operations. Haven't spent a dime on maintenance on the new system, yet the coatings are more uniform by far. We've found that Alodine 1200S is what makes the big difference in roll coat operations." At left, "Bill" Chapman points out samples of CAMPCO-produced aluminum siding. Note Alcoa aluminum trademark and Alodine seal, both used prominently in CAMPCO's sales and promotional activities.

Aluminum strip enters first stage of Alodine prefinishing process, the Ridoline 34 cleaner spray chamber. Four of the five Amchem processing stages at CAMPCO are spray-type chambers.

This 27-foot long Alodine immersion tank is responsible for CAMPCO's dramatic increase in production and quality as well as reduction in labor, downtime, and fuel savings as compared to their previous all spray system.

Painted Alodine-treated aluminum strip, ready for shipment to commercial customers, is checked by Steve Wilson, Siding Department Supervisor, of Carolina Metal Products.

Alodine-treated end products at CAMPCO include aluminum reflectors used in street lighting. Many Alodized products are used in the nation's highway program—traffic signs, highway markers, license plates, etc.

Maintenance" says Carolina Designed Spray-Dip Process!"

New Maintenance-Free System for Aluminum Pre-Finishing Made Possible by Amchem's Alodine* 1200S

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They're making roll coating history down South, thanks to Amchem's Alodine 1200S! North Carolina based CAMPCO, one of the country's top strip processors, is gaining higher quality and greater output with a maintenance-free, Amchem-developed chemical conversion coating system for continuous-strip prepaint treatment of aluminum. Heart of the system, a 27-foot Alodine 1200S dip tank introduced into CAMPCO's former 5-stage Alodine spray metal preparation line.

New Design Cuts Operating Costs

The basic simplicity of dip tank design started CAMPCO off with a low initial capital expenditure and has resulted in significant day-to-day operating savings. The dip phase eliminates atomizing of strong acid materials and the need for pumping them through intricate piping systems, entirely eliminating nozzle clogging. In addition, machine exhaust requirements have been simplified and pump maintenance eliminated.

Savings Add Up

Additional CAMPCO savings with Alodine 1200S continue to pile up. Line speeds have been increased over 25 percent, fuel savings cut up to 30 percent, bath start up time greatly reduced. As "Bill" Chapman says, "I wish all of our problems were solved to the extent our prefinishing problems have been solved."

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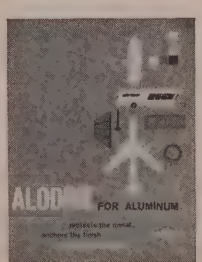

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SPECIAL EXTRUDED SHAPES make aluminum tower as strong as steel; one-fifth as heavy

AN ALL-ALUMINUM electrical transmission tower — exceeding standard strength requirements yet weighing only one-fifth as much as a comparable steel tower — has been developed by Handley-Brown Co., Jackson, Mich., for Line Material Industries of Milwaukee.

The pole is fabricated from aluminum 6061-T6 extrusions supplied by Olin Metals Division's Gulfport, Miss., plant. The pole will carry 110-kv transmission lines through residential, commercial and industrial areas where attractiveness is essential.

The welded aluminum truss-type tower is generally competitive in installed cost with its steel counterparts, says Line Material. Aluminum's light weight offers substantial savings in handling and erection costs, in addition to saving on maintenance.

"The new lattice pole was developed along basic Alrectic principles," says Harold E. Handley, president of Handley-Brown. "Enthusiastic about the proven advantages of aluminum substations, engineers asked us to build the same advantages into a 69-kv transmission tower.

"Our goal was to reduce the tower weight sharply, without loss of strength. We did it by designing special extruded shapes for the main structural members — instead of merely substituting aluminum for steel."

Did It With Bulb Angles

Both the Alrectic system and the new lattice pole employ a specially designed extrusion for the chord angles at the truss corners. The edges of these chord angles are enlarged with a bulb.

Line Material explains that the bulb strengthens the edge where failure usually begins; provides room on the chord angle edge for a longitudinal groove into which the lacings are welded (see picture); permits an exceptionally strong joint because weld metal flows down the end and up the side of the lace; and the bulb dissipates weld heat, minimizing effect on weld area.

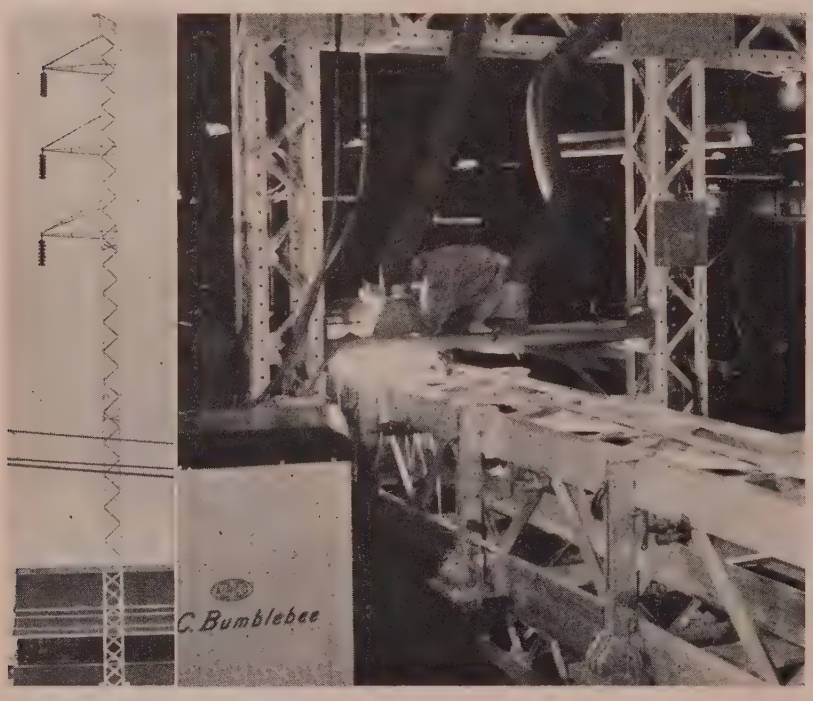
A significant tower feature is that it does not taper in size toward the top of the pole, but "tapers" in weight. In other words, it is built like a well-balanced fishing rod — heaviest near the base where strength is most needed, and tapering off to the lightest chords at the top where excess weight is undesirable.

This tapering is achieved by using three different sizes of chord angles and by varying the weight and number of aluminum stiffener plates welded inside. The largest chords, heavy 3 by 6-inch extrusions, rise 32 feet from the base. Welded to these are smaller 23-foot-long chord angles made of 3 by 3-inch extrusions, which are topped by thinner 3 by 3-inch chord angles.

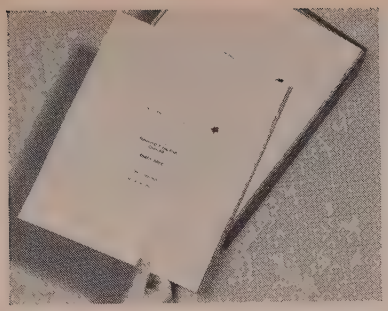
Since the pole is all-welded, slippage that often accompanies bolted construction is eliminated. The only bolting needed is to connect the tower to the concrete foundation base.

Poles fabricated for recent tests are 85 feet long and 2 feet square. Basically, they are truss assemblies composed of specially shaped extruded corner chord angles, laced with T-channels. The complete pole, including three crossarms each nearly 7 feet long, weighs 1400 pounds. Erected towers are free-standing, only those at corners where transmission lines end or change direction needing to be guyed.

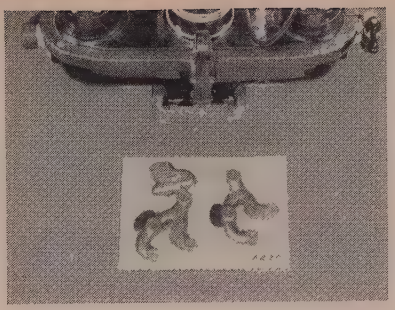
Structural tests showed towers spaced 600 feet apart are capable of sustaining loads equivalent to winds of 140 miles an hour while supporting three conductors of three crossarms, plus static wire. Under these loads the pole deflected 84 inches from the horizontal without failure of a single member or weldment, then returned virtually to horizontal when the loads representing lateral stresses were removed.



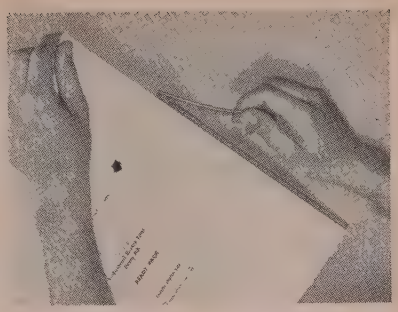
■ ***New electrical transmission tower is shown at left. Notice that lattice pole is not tapered like conventional one, but has the same dimensions from top to bottom. Poles fabricated for testing purposes were 85 feet high and 2 feet square. At right, extrusions are being welded to form pole section.***



1) No darkroom loading. Ready for exposure as it comes from the box.



2) Just place in position and expose —the film is protected from dust, dirt, light and moisture.



3) In the darkroom, pull the rip strip, remove film, and process.

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Welding Aluminum

Part 4: A Comparison-MIG vs. TIG

In separate articles we have detailed all major facets of the joining of aluminum via the metal-inert-gas (MIG) and tungsten-inert-gas (TIG) welding processes. Here, we compare and contrast the two methods, while considering weld properties, ease of welding, speed, operator instruction, and economics.

Based on information supplied by Aluminium Laboratories Limited, Research Division of Aluminium Limited

MOST of the welding of aluminum done today is with either the metal-inert-gas (MIG) or tungsten-inert-gas (TIG) process. To determine which of these processes is the best for a particular job thorough knowledge of the advantages and disadvantages of each is necessary.

Table 1 compares the merits of the two processes. However, these comparisons are general and do not cover all applications. Individual applications should be studied considering the table and such factors as quantity of welding, cost, thickness of material, size, location and position of parts, and properties of welds.

Quantity Another Factor

Both quantity of welding and whether or not it is repetitive influence the selection of a process and auxiliary equipment. In most cases, only the inert gas shielded arc and brazing processes need be considered. This applies to both large quantities and small quantities of welding which must meet standard specifications of quality. Quantity welding usually justifies a large investment in equipment, including jigs and fixtures.

TIG is well adapted to machine welding of light gauges where flanged joints are used or where the weld can be kept in compression during solidification. MIG, already a semi-automatic process, is well suited to machine welding for many applications, particularly repetitive work.

Overall welding costs include capital expenditure for equipment, actual welding expenses, and cost of pre- and post-welding operations. Of these factors, actual welding expenses are the most important. They include cost of filler wire, gas, overhead, maintenance of equipment and labor (factors considered when compiling Table 1).

Generally, the fastest process is the most economical. High speed welding, properly applied, can greatly reduce handling and floor space and cut costs, outside the actual welding operations.

Thick sections requiring multiple passes are joined most efficiently by the MIG process. Sections of moderate thickness (0.10 to 0.25 inch) may be joined efficiently by both processes. Material under approximately 0.10 inch thick is usually joined by inert gas shielded machine welding or manual TIG welding. But careful attention should be given to joint design and jigging regardless of the process used.

MIG welding can be used under special circumstances to avoid distortion and in the welding of relatively long joints of regular contour.

Large assemblies usually require field welding of parts or subassemblies. In such cases, MIG is preferred because of its portability and ease of position welding.

In general, the MIG process produces joints which have better properties than those made by TIG. Higher mechanical properties, better corrosion resistance, and better color match after anodizing stem from MIG's higher welding speed.

Advantages of MIG Welding

Most of the advantages of the MIG process result from the fact that a direct current (d-c) with high current density is used. This is possible because the electrode is consumable and the current is therefore not limited by the melting temperature of the electrode as is the case with the TIG process. These factors combine to produce very efficient heat transfer in the arc and result in the following advantages:

Six Benefits

1. Welding speeds approximately twice those of TIG.

2. High speeds result in fast chilling of weld area. This minimizes distortion. Distortion encountered with MIG is no more, and usually less, than that encountered when steel of the same thickness is welded with flux-coated stick electrodes. With MIG, as soon as the arc is established filler metal is added to the joint. This is instrumental in preventing distortion in cases where sheet is being welded to framing members.

3. MIG produces deep penetration, especially into the root of fillet welds. Difficulty of getting adequate penetration in these welds, unless strict supervision and highly trained operators are employed, is one of the disadvantages of TIG.

4. High speeds and fast chilling of the weld area prevent mechanical properties of the joint from being reduced as much as they are by slower welding.

5. Speed offers still another advantage—corrosion resistance of the base metal in the heat affected zone is not reduced as much by MIG as by TIG. While the corrosion resistance of TIG welds is excellent, under severe corrosive attack, MIG welds will produce better results.

6. MIG materials are more expensive than those used for TIG but because of the higher welding rate which results in more feet of finished weld

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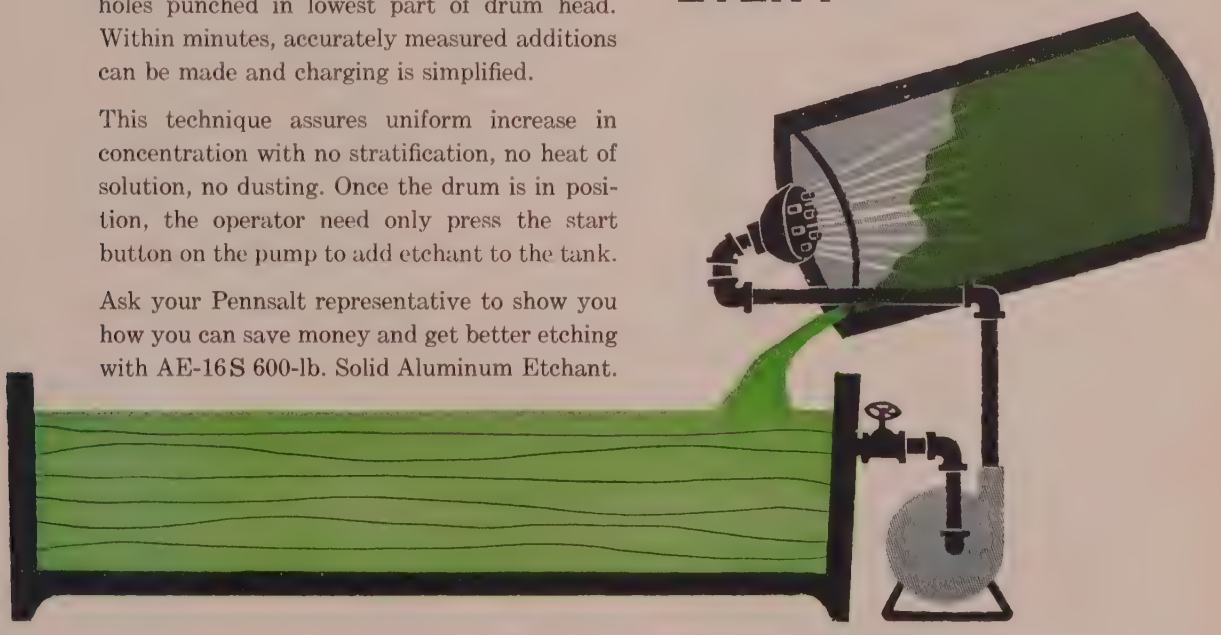

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per hour, MIG welding is slightly more economical than TIG.

The quality of MIG welds is very high. Some porosity had been encountered but with improved techniques and better welding wire, porosity has been virtually eliminated.

The MIG process is ideal for position welding because the arc force projects weld metal across the arc at such high velocity it is not affected by gravity.

Because of the semi-automatic nature of the process it is very easy to train men to operate MIG equipment. Usually, one-half day's instruction is all that is required to train an operator to make satisfactory welds in all positions.

When TIG welding, the operator is limited to the length of weld which can be made by the length of filler which he can conveniently control. This means that he usually cannot make a weld more than 1 foot long without breaking the arc. With the MIG process the filler is added automatically so the operator is usually able to weld more than 2 feet without having to break the arc and change position. This results in fewer weld craters and more feet of welding per hour.

One-Hand Welding

Another factor contributing to the high MIG welding rate is that the operator uses one hand to weld, which is naturally less tiring than using two as for TIG. Because of this he can increase his operating factor (percentage of total weldor time spent in actual welding), and therefore increase production.

Since the MIG process uses d-c, no high-frequency current is required for arc stabilization as is the case with TIG. This eliminates the cause of the radio interference which is sometimes encountered when TIG welding.

The MIG process has a high rate of metal deposition when large diameter (3/32 or ⅛ inch) filler wires are used with high welding currents. This high deposition rate is required when welding heavy sections or in building up pistons, etc.

Because of its semi-automatic nature MIG can be readily adapted to machine welding applications on materials varying from 0.030 inch to approximately 3 inches thick.

Disadvantages of MIG

The major disadvantage of MIG welding is that with equipment which pushes the filler wire through the flexible, 3/32-inch sheet is the thinnest which can normally be manually welded. Equipment which pulls the filler through the flexible can handle 0.050-inch sheet.

As pointed out, the deposition of filler material as soon as the arc is struck may be an advantage in controlling distortion. But when welding heavy material it is sometimes found that cold weld-starts are produced. They are characterized by a build-up of filler material at the beginning of the weld with little or no penetration into the parent material. This can be prevented by preheating heavy sections to 200-250°F. Otherwise, if quality welds are required, cold starts must be chipped out and rewelded.

TABLE 1

Comparison of MIG And TIG Processes

Application Considerations	Relative Rating MIG	TIG
ECONOMICS		
Cost of equipment	2	1
Maintenance	2	1
Operating factor	1	2
Training time	1	2
Volume of metal deposited	1	2
Welding time	1	2
VERSATILITY		
Welding 0.050 sheet, or less	—	1
Welding metal heavier than ⅛"	1	2
Position welding	1	2
Short welds	2	1
Use on welds having abrupt contour change	2	1
Low speed welding	2	1
WELD QUALITY		
Strength	1	2
Ductility	1	2
Corrosion resistance	1	2
Absence of defects	1	2
Penetration	1	2
Distortion	1	2
MACHINE WELDING		
With adding filler	1	2
Without filler	—	1
Light gauge butt joints	2	1
Heavy gauge butt joints	1	2
Fillet Welds	1	2
WELDING CASTINGS		
General reclamation	2	1
Reclamation to specification	2	1
Repair welding	2	1
Fabrication with castings	1	2

Fillers for MIG welding are limited to 1100, 4043, 5254 and 5056 alloys. Therefore this process will not find as wide an application for welding castings as will TIG. If required in large quantity special fillers are obtainable. Alloy 5056 filler wire may cause weldability problems, particularly when welding materials under ¼ inch thick.

More maintenance is required on MIG equipment than on TIG.

TIG Welding's Advantages

TIG can be used to weld properly jigged material as thin as 0.020 inch. It can also weld material up to approximately 1 inch, but for practical purposes ⅜ inch is the thickest material which should be TIG welded (see Table 2).

The fact that filler does not have to be added to complete a weld may be another advantage. This is important in welding joints which depend upon the melting down of an upturned flange or fusing of tightly butted edges for filler material. The advantage of this type of joint is that the very smooth weld produced requires no cleaning or grinding. Joint design of this type is often used in the fabrication of containers, tubing, and other related products where a smooth, flush weld is required.

Since filler is added manually the operator has complete control of the puddle at all times. This is a definite advantage, especially in the butt welding of small and medium angles and other shapes where the heat requirement at the toe of the angle is less than that of the heel.

Good Corrosion Resistance

Corrosion resistance of welds made with this process is superior to that of welds made with a process which uses a welding flux for oxide removal.

The operator's excellent control of the weld puddle makes TIG useful for welding castings where variations in material thickness are often encountered. The wide variety of filler alloys which can be made available in a foundry aids the popularity of this process for welding castings.

TIG machine welding of light gauge material, where the addition of filler is not required, can be carried out easily. Filler is obtained by upsetting the material by pressure during solidification of the weld or by flanging the material and melting down the flange during welding.

Machine welding is not usually used on thick material where filler has to be added. However, by employing a mechanism similar to that used for MIG, filler material of small diameter can be fed into the weld puddle for a

AQUADAG® SOLVES AN INTRICATE MOLD PROBLEM FOR OSWEGO CASTINGS

A complete permanent mold, used in casting high-pressure gas meter housings, is shown being sprayed with 'Aquadag'.

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There was also the problem of metal flow. Housing walls vary in thickness between ¼ inch and the ⅝ inch flange which runs around the top. Close tolerances must be maintained to insure a proper fit during final assembly. "Holidays" caused by the improper flow of metal into critical areas of the cavity, presented a constant reject problem.

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With 'Aquadag', the savings at Oswego have been "considerable". Castings are more uniformly formed, have smoother surface finish, and part easily. Because of greatly facilitated metal flow and release, mold life is lengthened. Rejects are the exception rather than the rule.

Oswego Castings manufactures several products with highly defined parts which require molds having intricate sliding members or collapsible cores. The fact that finding the effective lubricant they needed to overcome their *most difficult* problem, resulted in the selection of an Acheson product . . . indicates it can be of equal value to you. We invite your inquiry.

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A detailed discussion of the various Acheson semi-colloidal and colloidal dispersions available for coating permanent molds, die cavities, and steel and cast-iron chills, is contained in Acheson Bulletin 425. It describes why Acheson colloidal graphite is so extensively used as a mold and die lubricant, as well as an extremely effective heat-resistant parting agent. The microscopically fine graphite particles are suspended in a variety of liquid carriers. When mixed with the appropriate diluent, the dispersion can be conveniently applied by spraying, brushing, dipping, or swabbing. As mold coatings they provide greater, more uniform surface coverage. Highly tenacious, these thin coatings resist the scouring action of molten metal, do not volatilize, and will not build up. Sticking in the mold is reduced to a minimum; usually eliminated completely. Less finishing is required, rejects are fewer, and die and mold life is extended.

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We invite you to send for your copy of Bulletin 425, "Colloidal Dispersions For Use In Metal Casting", at your earliest convenience. It should prove helpful to you in realizing greater production economies. Write direct to Dept. MM-80.

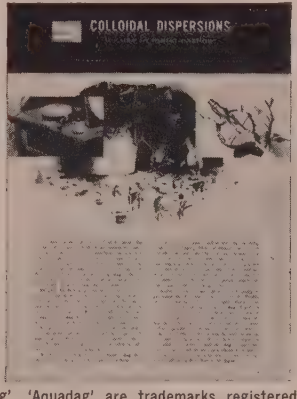

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TABLE 2: APPROXIMATE COSTS OF TIG EQUIPMENT

Capacity of unit	Cost in Dollars: Welding Unit	Torch	H.F. Unit	Automatic Controls	Total	Approximate Minimum And Maximum Thickness Which Can Be Welded
200 amp	700-1100 (1)	200	(1)	(1)	900-1300	0.020"-0.125"
300 amp	500 (2)	200	250	250	1200	0.020"-3/16" (3)
400 amp	600 (2)	200	250	250	1300	0.020"-¼" (3)
500 amp	1100-1300 (1)	200	(1)	(1)	1300-1500	0.020"-⅜" (3)

(1) "Packaged Power" units include high-frequency (H-F) unit and automatic controls.

(2) Standard a-c arc welding transformers as used for steel do not have built in H-F units or automatic controls for TIG welding.

(3) Welding of 0.020 in. material possible only if machine is specially equipped to reduce current below the normal rated output.

particular application.

TIG's Disadvantages

Since alternating current (a-c) is used with TIG approximately only half of the heat generated in the arc is concentrated in the work. The remaining heat is concentrated in the electrode and dissipated by the coolant in the torch. Because of the relatively low welding speeds the total heat input to the joint is high and contributes to the following disadvantages of the process.

1. Welding speeds are only half of those possible with MIG, and even less in material over ⅜ inch thick.
2. Because of the lower efficiency of this arc, it takes longer to bring the weld area up to welding temperature. This causes the surrounding metal to expand and become distorted when heated.
3. TIG does not penetrate as deeply as MIG. Because of this it is difficult to get fusion and penetration at the root of fillet welds.

Since TIG is a two-handed process requiring co-ordination of both hands it takes two weeks of training before an operator can produce satisfactory welds. Also, the process demands continuous concentration to correctly manipulate the torch and add filler wire. This is fatiguing, and makes TIG's operating factor less than MIG's.

Radio interference generated from the high-frequency unit is sometimes encountered with the TIG process. Usually this can be reduced to an allowable level by proper adjustment of the spark gap, grounding, and installation of equipment.

Cost of Welding

In computing welding costs it is assumed that the welding arc is not maintained for more than 33% of the time. In other words, except in special cases, the operator does not weld for more than 20 minutes out of each hour. This 33% is the operating factor.

Certain production jobs where quick operating jigs are employed have operating factors exceeding 33%. In other jobs, such as in tank or shipyard work where a large amount of fitup is necessary and where only one of an assembly is being made, the operating factor might be much less than 33%.

Factors to Consider

In determining the cost of welding a product or assembly many factors must be considered. The first is usually the cost of equipment which is dependent on the welding process to be used. But, don't place too much emphasis on this since, in many cases, the purchase of a high cost piece of equipment may increase production rates to a point where the equipment expense is written off in increased production. However, cases not involving mass production cannot justify high equipment cost.

Table 2 gives the approximate price of TIG equipment, while Table 3 covers MIG. Since these costs are only approximate, they should be used for estimating purposes only. For up-to-date accurate costs contact a welding distributor.

The TIG units described in Table 2 are listed according to capacity. The 300 and 400 ampere machines are standard a-c welding transformers, as used for steel. They can be converted for welding aluminum and other metals by purchasing the appropriate torch, high-frequency unit and automatic controls. This type of outfit is very popular with shops doing only a small amount of aluminum welding since they usually already have an a-c transformer.

The MIG welding unit listed in Table 3 includes the wire drive mechanism, welding gun, automatic controls, primary contactor, and spare parts. The cost of the power source is shown separately.

* * *

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TABLE 3: APPROXIMATE COSTS OF MIG EQUIPMENT

Type	Cost in Dollars: Welding Unit	Power Source	Total	Approximate Minimum And Maximum Thickness Which Can Be Welded
Regular	2000	800-1400	2800-3400	3/32"-3"+
Small wire	2800	800-1400	3600-4200	0.050"-3"+

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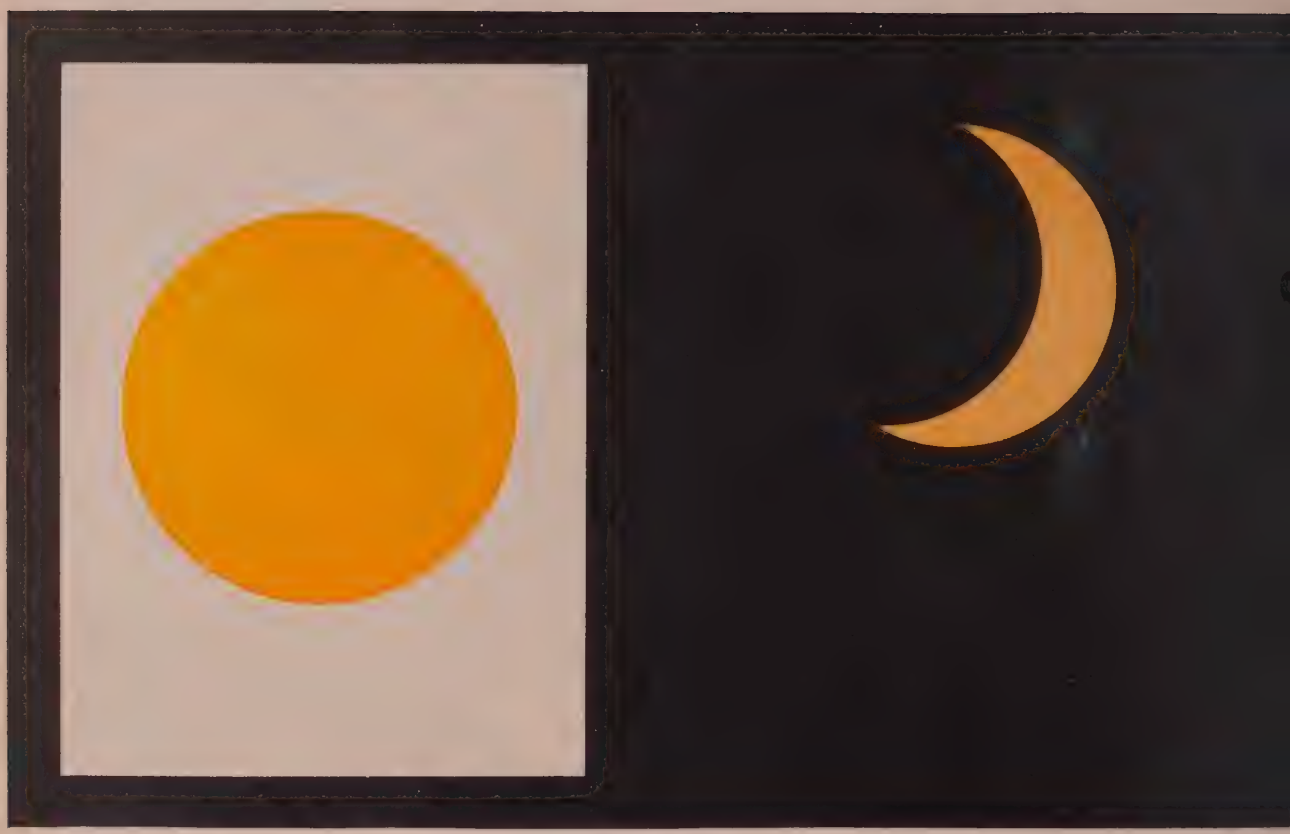

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Twin-Hulled Aluminum Craft Withstands Corrosion, Durability Tests

Extensive tests were given what is claimed to be the first welded aluminum power catamaran ever built. Corrosion resistance and durability were examined. The *Lee Scott* passed all obstacles and is to be put in service in the Los Angeles area as a pleasure and fishing boat.

EXTENSIVE sea trials and testing have been completed on the *Lee Scott,* a 45-foot, high speed aluminum catamaran built by the Forster Shipbuilding Co., Inc., Terminal Island, Calif. The boat will be operated by D. E. Woolever, Inc., Los Angeles, for sports fishing, passenger service, excursions and other special purposes.

The boat was tested for two years, being put in service in all types of weather, during which no structural weaknesses or weld failures were discovered.

An unscheduled structural test occurred about a year ago. In a dense fog a 150-ton tug rammed the *Lee Scott* amidships while it was moored at her berth. The force of the collision snapped off the 16-inch berth piling. Estimates are that the ship absorbed approximately 500,000 foot-pounds of energy in stopping the tug, yet no shaft misalignment or weld failure occurred. The tug's bow left a small indentation which necessitated replacement of a 4 by 6 foot plate.

Alloy 5056 Used

Advantages of aluminum are pointed out by R. F. Wingo, naval architect who helped develop fabrication techniques for the catamaran. "This is the first time aluminum has been used in a power catamaran," Wingo pointed out. "Because of its high strength-to-weight ratio, aluminum seems logical for this marine application. We used 5086 because of its good weldability and its corrosion resistance." Kaiser Aluminum and Chemical Sales, Inc., supplied the aluminum.

In all, 9500 pounds of 0.219 inch sheet were used. In addition to the all-aluminum hulls, the 300 gallon fuel tank and the deck bait tank also are aluminum.

Forster welded the web framing sections flat on the ground, then placed them four feet apart on wooden blocks. The vessel's longitudinal members were then positioned 24 inches apart and welded to the framing. As the twin-hulled craft took shape upside down, the bottom logitudinal members formed the upper hull line. Roll-formed aluminum panels made up the hull surfacing, with aluminum panel breakers inserted in each of the plates. Welding was done by the MIG (metal-inert-gas) process using straight argon and 5356 wire.

■ ***LEE SCOTT, catamaran built for excursions, sport fishing and other pleasure trips, glides through water during practice run. The vessel was tested for two years under all types of conditions to determine its strength and durability. The twin hulls of the boat, a 300 gallon fuel tank and deck bait tank were all fabricated from aluminum alloy 5056. Metal-inert-gas welding was used with a 5356 wire. During testing there were no structural failures of welds, or any type of breakdown in the aluminum components.***

No Cranes Needed

Aluminum's light weight speeded assembly. According to Wingo, "Plates were handed from one man to another without calling for a crane. By handling the aluminum correctly, we were able to fabricate it easier than either steel or wood."

To finish the hull, zinc-chromate primer was applied, then two coats of white paint. Bottom painting included a phosphoric acid rinse, zinc chromate, a base paint, and one coat of anti-fouling paint below the water line.

John R. Graham, Costa Mesa, Calif., consultant engineer for the project, said that nearly two years of planning and development work went into the *Lee Scott.* Kaiser Aluminum engineers gave technical assistance on welding and selection of alloys.

The boat is shown above traveling at its full 20 knot speed. It is powered by two 175 h.p. Chris Craft engines. Draft is 3½ feet; displacement 12 tons.

EXTRUSION DIES BY MOCZIK

A 63S Alloy aluminum extrusion, actual size, extruded on a 14-mandrel die. Samples of this extrusion on request

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Light-Fast Anodizing Dyes

Organic dyestuffs produced by Durand & Huguenin S.A., Basle, Switzerland, are claimed to show excellent fastness to light, and weather when properly applied. Range of colors includes shades of yellow, red, blue, turquoise, green and black.

by E.C.K. Kraan, Carbic-Hoechst Corp., Westfield, N. J.

THE use of dyed anodized aluminum in architecture is becoming more and more widespread. While there is only a very restricted range of inorganic pigments with sufficient fastness for this purpose, our company has developed a series of organic dyestuffs which offer a complete range of colors whose excellent fastness to light and weather have been confirmed in use.

We are now sure that these weather-resistant dyestuffs, employed in the coloration of external aluminum building surfaces, offer to architects several novel possibilities. To achieve excellent fastness, however, it is essential to employ oxide films 20 to 25 microns thick.

Fastness is distinctly inferior when dyed on thinner films. Furthermore, certain colors will give sufficiently deep shades only on thick oxide films.

For architectural applications only medium to deep shades should be considered. As a general rule lighter shades, even on thick oxide coatings, will not have the same fastness to light and weather as the medium-deep shades.

A good oxide film and good dyeing can be obtained only on pure aluminum or on suitable alloys. Certain alloys influence the shade obtained. If the composition of the alloy is known it is possible to judge this influence to some extent.

The presence of 1-2% manganese produces a brown-bluish matt appearance. With greater quantities of manganese the shades become still browner, approaching even a grey-brown. Magnesium (0.8-1.3%) gives a slightly matt appearance, becoming more noticeable as magnesium content increases.

Silicon (0.6-0.9%) produces a greyish shade which grows darker with an increasing silicon content. Copper-aluminum alloys have a matt appearance when anodized, but rather stronger dyeings are obtained on such alloys. The oxide film is likely to be more porous and its absorption capacity for dyestuffs is increased considerably.

In order to produce a flawless oxidation and a level dyeing, it is necessary to remove any grease or dirt from the aluminum surface. This may be done with solvent cleaning with organic compounds, by vapor degreasing, by alkali cleaning with weak alkali or trisodium phosphate, or by treating with fatty alcohol sulphonates.

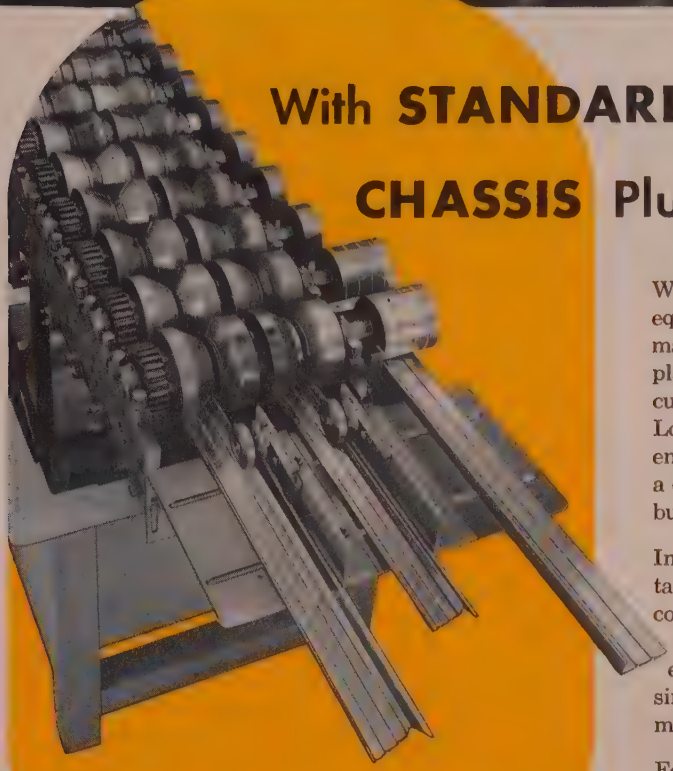
Although the degreased metal surface may be free of oily substances, it may still be coated with an oxide scale. To remove this and produce a bright etch finish, it is often necessary to submit the aluminum to a pickling process.

This is done by first immersing the metal in a caustic soda solution (15% by weight) at 100-140°F for not more than ten minutes, then rinsing thoroughly and dipping into a solution of nitric acid (1:1 mixture of acid to water) at 160°F. The acid dip removes smut which forms on the surface during caustic etching. After a final rinse, the aluminum is ready for anodizing.

■ ***Aluminium Deep Black dye was used on facade and interior facings of Palazzo Olivetti, Milan, Italy. Architects: Gian Bernasconi and Annibale Fiocchi.***

Anodizing

Electrolytic oxidation produces a surface film of oxide which has a strong capacity for absorbing dyestuffs. In order to avoid any variation in this absorptive power, it is essential to maintain careful control over the anodizing process, which is usually carried out in



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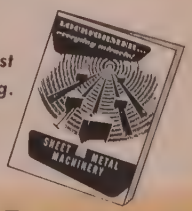

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a sulphuric acid bath using direct current. Best results are obtained as follows:

Sulfuric acid	15-18% by weight
$Al_2(SO_4)3$	15-25 grams/liter
Time	60 min. for colors (20 microns=0.8 mil) 70-75 min. for black (25 microns= 1 mil)
Current density	12-14 amps/sq.ft.

After anodizing, the aluminum is rinsed thoroughly in running water and neutralized in a weak solution of ammonia or carbonate of soda, then rinsed again to avoid contamination of the dyebath, which might affect its stability and keeping properties. Dyeing follows.

Dyestuff solutions react with certain metals used for manufacturing tanks and plumbing. Acid resisting stainless steels are the best materials for construction of this equipment. They will not cause variation of shade or precipitation of dyestuffs. Not all stainless steels are suitable, however. Practical experience has shown that the nickel/chrome/molybdenum series is best.

Earthenware and acid resisting cement dye vessels are also suitable, as are enameled tanks. Acids resisting plastic coatings such as polyethylene, PVC, etc. can be used to protect the interior of dye tanks. The fact that some of these coatings are sentitive to heat must be taken into consideration, however.

Organic dyes are employed more and more today because of the great progress made recently in light and weather fastness. The processor now has a wide choice of yellows, reds, blues, turquoises, greens and blacks. With the exception of the golds and bronzes, all the colors are produced with new organic dyestuffs, generally of the metal complexing type.

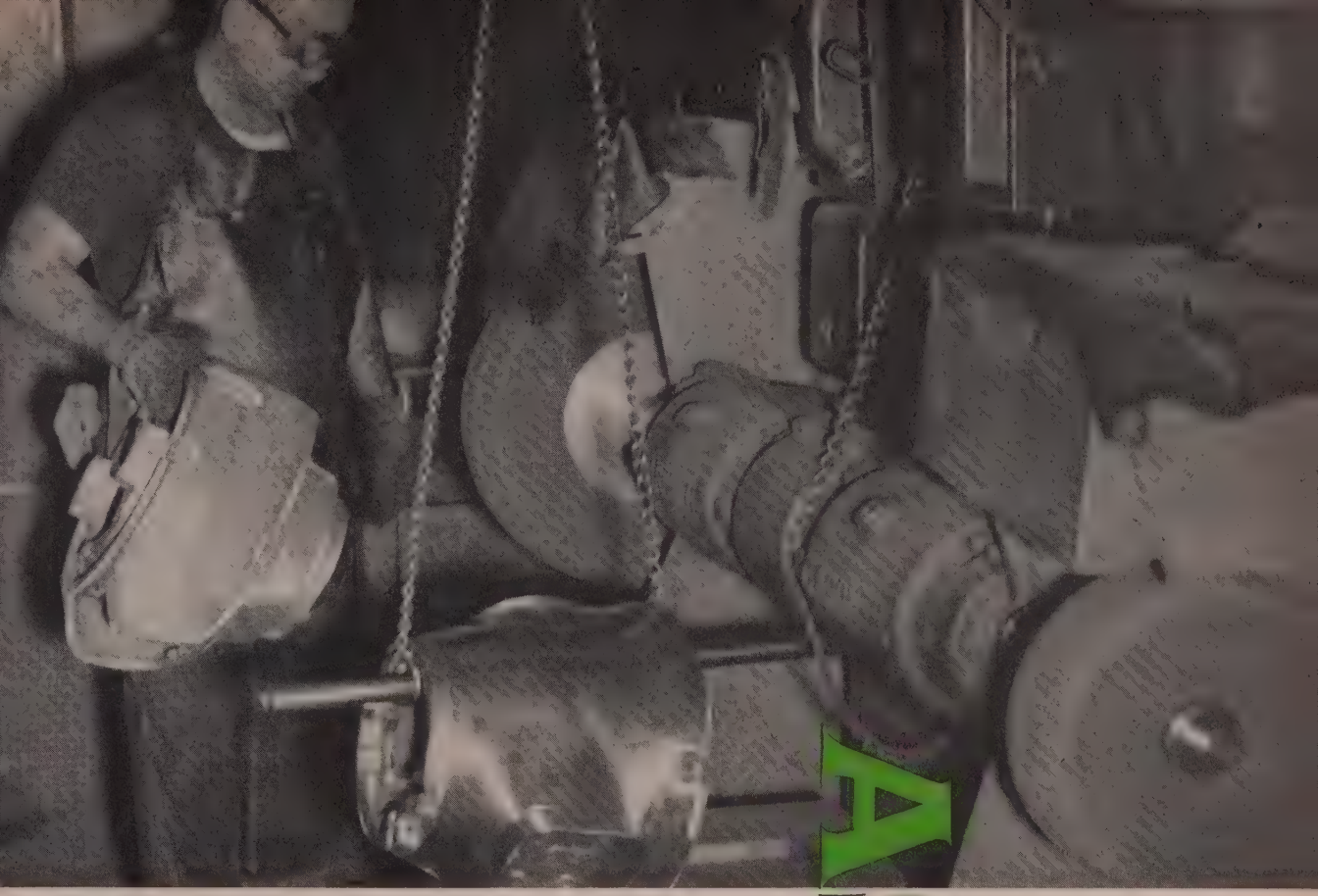
The aluminum dyestuffs generally possess good solubility. Solutions are

Recommended Bath Conditions and Fastness* of Weather Resistant Anodizing Dyes

Dye	Gram/ Liter	Immersion Time (min)	Bath Temp. (°F)	pH	Sealing Bath	Light* Fastness	Weather* Fastness	Remarks
Aluminium Yellow G3LW	1	20	150-160	5.5	Ni/Co	7-8	perfect	Best fastness of any known yellow. Becomes a little lighter if water-sealed.
Orminal (gold)	30 5	½-1 2-3	140 140	5 5	water			Concentrated solution more stable than weak solution.
Aluminium Fast Red B3LW	5	20	160	5.5	water	8	perfect	Best fastness of any known red. Becomes a little lighter in water sealing bath.
Aluminium Red GLW	4	20	160	8.8	Pb-acetate	7	good	Very fast to light when sealed with lead salts.
Aluminium Copper 2RLW	2	20	140	5.5	water	7-8	very good	
Aluminium Blue LLW	1	20	160	6.3	Ni/Co	8	perfect	Outstanding fastness
Aluminium Turquoise PLW	5	20	160	5.5	Ni/Co	8	very good	Extremely fast. Bleeds slightly in sealing bath. Not for dark shades.
Aluminium Turquoise PLW + **Aluminium Yellow G3LW**	5 2.5	20 20	160 160	5.5 5.5	Ni/Co	7-8	very good	Mixture of very fast colors. Yellow exhausts a little more rapidly than blue. Bleeds slightly in seal.
Aluminium Green GLW	6	20	85	5	Ni/Co	7	very good	Bath yield lowered by action of atmospheric oxygen. Regenerate by adding 5-10 ccs sodium bisulphite 76° Tw per liter of dye bath.
Aluminium Deep Black MLW	8	20	176	4	Ni/Co	8	perfect	Outstanding fastness, but not very suitable for producing grey shades.

***NOTE: Light fastness figures, determined by normal methods used in textile industry, were assessed by exposure to sunlight: 1 = poor; 3 = moderate; 5 = good; 6 = very good; 7 = excellent; 8 = perfect.**

***NOTE: Weather fastness was determined as percentage of loss of depth of shade after one year's exposure: Perfect = up to 10% loss; very good = up to 20%; good = up to 30%; moderate-good = up to 40%; moderate = up to 50%.**



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easily prepared by adding hot water—free from iron and lime, if possible. When preparing solutions with a high dyestuff content, it is advisable to paste the dyestuff in a little hot water before diluting it to the desired volume.

When kept in suitable containers and under proper conditions, these solutions remain stable for months—even years. It is rarely necessary to make any adjustment in pH, provided the solution is not contaminated by carry-over of acid or alkali to the dyebath. In this event, correction of the pH should be made. An excess of aluminum salts in the dyebath is detrimental. (The proper pH and concentration of dyestuff for optimum results are shown in Table 1.)

Temperature and Time

With the exception of our Aluminium Green GLW, the dyebath temperature ranges between 140° and 176°F. Very good results are obtained with the green dyebath at about 86°F, but more recent tests have proved that a bath temperature of around 150°F gives superior results as far as fastness to light and weather is concerned.

With our Aluminium Deep Black MLW, optimum results are obtained with a dyebath temperature of 175°F.

Duration of dyeing with the weather resistant dyestuffs is approximately 20 minutes (see Table 1).

Sealing of the anodized and dyed aluminum surface closes the pores of of the aluminum oxide, produces a good fixation of the dyestuff in the oxide, and improves the fastness of the dyeing. The simplest sealing method consists of immersing the aluminum in boiling water of less than 8° of German hardness (pH 5.5) for 30 to 60 minutes.

However, sealing in a salt solution enhances the fastness of some dyestuffs. The nickel-cobalt seal which is quite common in Europe consists of 5.6 grams of nickel acetate, 1 gram of cobalt acetate, and 8.4 grams of boric acid per liter of water. The bath is held at the boil and its pH is 5.5. The aluminum is held in the bath for 30 to 60 minutes.

Identical sealing results are obtained with the nickel acetate bath commonly used in the U.S. This is a 0.5% solution of nickel acetate with a pH of 5.5, adjusted with either acetic or boric acid. Another effective procedure is a combination seal of 5 to 10 minutes in the nickel acetate bath, followed by 15 to 20 minutes in hot water.

It is important that temperature of the sealing bath be kept at or very close to the boiling point.

(Table 1 shows sealing baths recommended for optimum results. The Pb acetate bath recommended for our Aluminium Red GLW consists of 5 grams of lead acetate per liter of water, at the boil; pH 5.5; immersion time, 30 to 60 minutes.)

After sealing, the material is rinsed, polished lightly to remove excess color, rinsed again, and dried.

In many projects throughout Europe, anodized aluminum has been treated with our special weather resistant organic dyes, and exposed to light and weather for many years (see list). It has been possible for us to verify the appearance of those which we have examined.

The list demonstrates that aluminum dyed with organic dyes can have excellent fastness, provided the processing has been carried out to our recommendations. It is best for the processor to make his own trials on the dyestuffs needed to attain the desired colors.

To determine the best conditions of application the processor should expose test panels to the weather under circumstances approximating, as close as possible, those to which the finished goods will be exposed. It is only after observing the results of these tests for 1 or 2 years at least that the processor can pass a useful opinion on the behavior of the dyeings over a period of several years.

Needless to say, there is no *absolute* degree of color fastness—neither for mineral precipitates, nor for organic dyes.

Protective Lacquers

The weather fastness of some dyed aluminum can be improved by special lacquers which protect both the anodic film and the dyeing. Such lacquers can be successfully applied only to completely dry and perfectly sealed surfaces to insure maximum adherence. To our knowledge, the best lacquers for this purpose are the following:

Methacrylate Lacquer 1234 (DuPont de Nemours, Inc., Wynnewood, Pa.). Spray on two coats, using solvent 36407, to a thickness of about 15 microns. It is possible to mix in Uvinol 490 (G.D.C.), which absorbs ultra-violet light. It is slightly yellowish-green, however, and may influence the shade of dyeing.

Half-Second Butyrate (Eastman Chemical Products, Inc., Kingsport, Tenn.) This is a colorless lacquer which absorbs ultra-violet light.

Permanax Sch 7501 (Spiess & Hecker & Co., Cologne-Raderthal, Germany.) A colorless lacquer applied by dipping at 70°F and bake dried 30 minutes.

Impal 1230 (Dr. Kurt Herberts & Co., Wuppertal, Germany). A protective lacquer applied by dipping at about 70°F and bake dried for 30 minutes.

We do not have sufficient experience with these lacquers to recommend any of them without qualification, and must therefore leave the choice to the processor's own discretion.

Partial List of Typical Buildings Employing Anodized and Dyed Aluminum

BELGIUM

Antwerp — "Sarma" storehouses; front decorations dyed with Aluminium Blue LLW; built in March 1958.

Brussels—Reception hall of exhibition building; front decorations, large panels, dyed with Aluminium Deep Black MLW; 1956.

CANADA

Toronto—Multi-story building; window frames dyed with Aluminium Deep Black MLW; gilt letters with ferric ammonium oxalate; about 1950.

GERMANY

Westphalia — Lining of indoor swimming pool dyed with Aluminium Blue LLW; 1953. (Dyed panels in permanent contact with chlorinated water.)

Dusseldorf—"Aluminium Zentrale"; stanchions and guard rail (south facade) dyed with Aluminium Deep Black MLW; 1953.

Frankfort — "Paradiso" cafe-restaurant; sections dyed with Elangold and Aluminium Blue LLW; autumn 1955.

Hessen — Traffic posts dyed with Aluminium Red RLW and Aluminium Blue LLW; 1954.

FRANCE

Paris—window frames of shop, "Reard," dyed with Aluminium Blue LLW; spring 1958.
Advertising signs, "Eau d'Evian," sited along main roads of France, dyed with Aluminium Red GLW, and Aluminium Turquoise PLW, with lettering in Aluminium Deep Black; erected in 1956.

ITALY

Milan — Olivetti administration building facade and interior facings dyed with Aluminium Deep Black MLW; 1956.

SWITZERLAND

Basle—"Deiss" shoe shop; window fittings and ornamental strip dyed with Aluminium Blue LLW; spring 1957.

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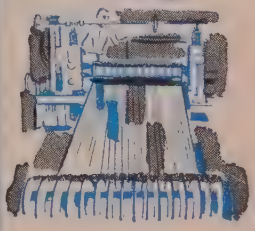

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Part 3:

THE ALUMINUM HEARINGS

Verbatim testimony of 15 representatives of industry and government is condensed in this report of the Yates Committee's hearings on aluminum, held last May. Committee members were Congressmen Yates, Multer, Moore, and Derwinski. Victor Dalmas was minority advisor. Part 1 (June issue) covered complaints of die casters, smelters, scrap dealers and extruders. Part 2 (July issue) reported testimony of a foil converter, two siding makers, a Commerce Department official and a Reynolds Metals spokesman. This final installment contains the testimony of representatives of Chrysler Corp., General Motors, Alcoa, Ford, and Kaiser Aluminum.

Trend to Economy Cars Trimmed Chrysler's Aluminum Needs From 100 Pounds Per Car in 1957 to 71 in '60

M. F. Garwood — Chrysler Corp.

THE FIRST automobile manufacturer to be represented at the hearings was Chrysler Corp. Spokesman for the company was M. F. Garwood, chief materials engineer. He had represented Chrysler at the previous hearings in 1957.

Garwood read a rather lengthy prepared statement describing the present and future use of aluminum at Chrysler.

Although Chrysler Corp. still leads the auto industry in amount of aluminum per car, its average use has dropped from a peak of 100 pounds per car in 1957 to about 83 pounds in the current model. (This does not include the Valiant and the Dodge Dart.) The industry average during that period has gone from 45 pounds per car to 51 pounds.

Commenting on Chrysler's lower per-car use of aluminum, Garwood explained that corporation engineers are continually re-evaluating all parts from the standpoints of materials, design, etc. Since 1957, some parts have been switched to aluminum, some away from aluminum. As the table on this page shows, aluminum has lost more than it has gained.

But other factors that have tended to further reduce Chrysler Corp.'s total use of aluminum include consumer preference for smaller cars and lower demand for aluminum-using optionals such as power steering and automatic transmissions.

Among Chrysler-made cars, the smaller the make, the less aluminum used. In the 1960-model year, for example, Plymouth averages 68 pounds of aluminum per car, Dodge 72 pounds, De Soto 86 pounds, Chrysler 88 pounds and Imperial 99 pounds per car. This gives the corporation average of 82.6 pounds of aluminum per car.

But when Chrysler's new entries (the Valiant and the Dodge Dart) are figured in, the average drops still lower. A 4-door Valiant with standard 6-cylinder engine, automatic transmission and power steering contains 65 pounds of aluminum. A similarly equipped Dart contains 70 pounds.

What's more, fewer auto buyers are demanding automatic transmissions and power steering. In the V-200 Valiant, this can reduce the amount of aluminum used to 39 pounds per car.

In the first quarter of 1960, the Valiant, Dart and Plymouth accounted for 81% of the corporation's total assemblies. This compares with the 53% accounted for by Plymouth, the company's only low-priced entry in 1957.

Now 71 Pounds Per Car

Taking these new factors into consideration, Garwood came up with "a more accurate index of aluminum consumption by our company," showing that "approximately 71 pounds of aluminum are used in the composite corporation car that is preferred in today's market."

He went on to point out that this 71 pound figure will probably hold true when the 1961 models are introduced. Beyond that, any increases in aluminum consumption "will depend upon the extent that engineering, manufacturing and metallurgical problems can be surmounted in order to extend aluminum applications to such major automotive applications as engines, radiators and bumpers," Garwood explained.

When these and other developments are adopted, a great rise in Chrysler's use of aluminum can be expected, he added. "For example, an aluminum engine could add approximately 75 to 100 pounds of aluminum to a car."

Chrysler now makes a large share of its aluminum parts in its own plants. A die casting plant in Kokomo, Ind., originally set up in 1957 as a pilot plant, has gradually taken over an increasing percentage of the corporation's die casting needs. A permanent mold foundry in Highland Park, Mich. produces pistons, and another foundry in Indianapolis makes one aluminum part.

Aluminum parts not made by the corporation are purchased from 84 suppliers.

In view of the success of the Kokomo die casting plant, Chrysler knew that its aluminum ingot requirements would grow substantially. So the big auto maker started to search for a source of supply "that would make available to us, within limits, a guaranteed supply of aluminum ingot at a price that did not fluctuate as widely as does the price of secondary aluminum."

This search led eventually to the creation of Chrysalum, Ltd., an aluminum supply concern set up jointly by Chrysler Corp. of Canada and Aluminum Co. of Canada. Organized in July 1959, it

New Aluminum Applications

Parts	Aluminum Weight (pounds)
6-cylinder intake manifold	6.56
Water outlet elbow	.34
Water pump housing	1.16
Distributor housing	.51
Oil pump body	1.54
Alternator housing	2.10
Instrument cluster housing	1.50
Seat-back hinges	3.30

Aluminum Parts Replaced by Other Metals

Parts	Aluminum Weight (pounds)
Extruded window frames	19.0
Torque convertor reaction shaft	1.0
Hydraulic steering gear housing	6.5
Oil filter base	1.0
Transmission adapter plate	6.5
Valve rocker shaft bracket	2.0

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Chrysler Corp. pays Chryslum the U. S. market price for aluminum, plus an additional 1.3 cents a pound for die casting alloy and an additional 4.1 cents for permanent mold piston alloy.

That concluded Garwood's prepared statement. The question and answer period brought out very little new information. Here are a few excerpts:

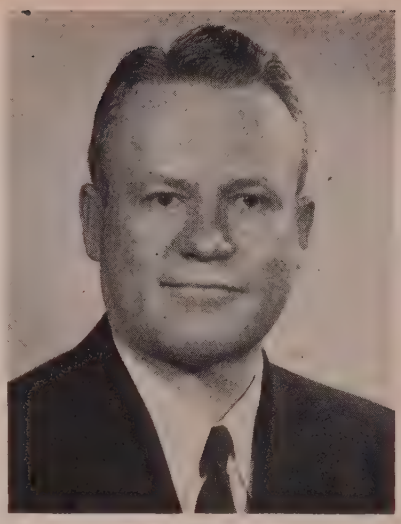
Yates. You are committed to purchase certain amounts of aluminum from Chryslum. Is there a price at which those ingots are to be purchased?

Garwood. The same price as here in the U. S.

Yates. Then you still have a competitive disadvantage compared with other companies that have molten metal contracts.

Garwood. We don't feel that it is a disadvantage.

Yates. I was under the impression that if something cost more it operated as a disadvantage. . . . Why do you feel that it is not if you have to pay more than they do for a material that is coming into greater use?



M. F. Garwood

"Approximately 71 pounds of aluminum are used in the composite (Chrysler) Corporation car that is preferred in today's market."

Garwood. If we had an arrangement to buy molten metal we would have a considerable investment to make and we would have to establish plants somewhat close to the reduction plant.

Multer. Who else submitted proposals to you with reference to aluminum?

Garwood. There were Alcoa, Reynolds, Kaiser and Olin Mathieson.

Multer. What were your total aluminum requirements in 1959?

Garwood. I have the figures for pig. The rest we actually buy as parts so I do not have that. But for pig, in 1957 we bought 18,932,000 pounds; in 1958 it was 11,732,000; in 1959 it was 37,600,000; and in the first quarter of 1960 we purchased 7,454,000 pounds. Those figures vary because of the inventories we carry, and do not represent our production.

'Sell to Your Competitors?'

Multer. Chryslum will apparently be able to sell to your competitors.

Garwood. No. If you are talking about the ingot we are buying . . .

Multer. Then, in effect, Chrysler is to take Chryslum's entire output?

Garwood. I think 51%.

Multer. What do they do with the difference?

Garwood. They sell that in any market they see fit. I suppose most of it in Canada.

Multer. Can they sell it to your competitors? To General Motors? To Ford?

Garwood. I think that is right — if it is their material.

That concluded Garwood's testimony.

GM Boosts Use of Aluminum Per Car From 12 Lbs in '51 to 52 in '60; Sees Hot Metal Deals Benefiting Small Firms

S. E. Skinner — General Motors Corp.

General Motors was represented at the hearings by Sherrod E. Skinner, executive vice president in charge of the Automotive and Parts Divisions. Subjects covered in Skinner's prepared statement included GM's past and present use of aluminum, percentage of aluminum parts supplied by outside firms, molten metal contracts, and GM's activities in the job foundry field. Here's a summary of his statement, followed by portions of his testimony.

Although General Motors is a large purchaser of aluminum, our total purchases represent a small percentage of the total market.

Primary production of aluminum in the U.S. and Canada totaled 2,553,000 tons in 1959. Secondary production in the U.S. was about 390,000 tons. GM's total purchases of pig, slab, and molten metal of both types amounted to 34,285 tons, or 1.16% of the total.

Table 1 shows the estimated average number of pounds of aluminum used in a composite four-door GM passenger car from 1951 through 1958, along with the amount of aluminum fabricated inside the corporation and the amount purchased from outside suppliers.

Table 1—Use of Aluminum in Composite GM Passenger Car

(average pounds per car)

	Fabricated Outside the Corporation	Fabricated Inside the Corporation	Total
1951	7.37	4.51	11.88
1952	7.10	4.32	11.42
1953	7.50	7.74	15.24
1954	13.17	7.35	20.52
1955	15.44	7.35	22.79
1956	14.57	13.42	27.99
1957	18.25	14.26	32.51
1958	19.06	26.12	45.18
1959	21.58	26.13	47.71
1960	18.55	33.62	52.17

The increased ratio of pounds per car fabricated inside the corporation starting in 1958 was due entirely to substituting aluminum for grey iron castings which had previously been made by GM divisions. Examples are the transmission cases on most of our cars. The aluminum engine for the Corvair has contributed to our increased average usage.

General Motors consistently increased its outside purchases of castings in each year through 1959. In 1960 the decrease of 3 pounds per vehicle resulted from discontinuance of the Buick flight pitch transmission which was produced by outside sources.

In 1958 we told the Committee that we thought it entirely possible that the average use of aluminum could increase to 75 pounds per car by 1965. It now

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appears that the trend to aluminum is developing more rapidly than we anticipated. The 1960 Corvair, for example, is powered by an aluminum engine which requires 124.31 pounds of aluminum.

The extent to which aluminum will be substituted for iron in future engines of other GM cars cannot be predicted with any certainty. Design, cost and styling must be analyzed before any accurate prediction can be made. If the trend of the past few years is any indication, it is conceivable that the average use of aluminum could double by 1965.

In addition to future engines there are promising areas for aluminum in the manufacture of axles, transmissions, brake drums, radiators, grills, hardware and decorative trim.

General Motors is currently purchasing fabricated aluminum from 390 suppliers, 156 of whom have from 1 to 100 employees. An additional 48 suppliers are not included in this figure because employment statistics are not available. We believe, however, that all are in the 1-100 group.

We are currently operating two foundries at which we fabricate castings from molten aluminum. One, at Massena, N.Y., is operated by Chevrolet. The other, at Jones Mills, Ark., is operated by the Central Foundry Division. A third molten aluminum operation will begin on July 5, 1960, at the Bedford, Ind., foundry of Central Foundry Division.

Molten Metal History

We initiated molten metal discussions with Reynolds Metals in the late forties. We and Reynolds recognized that the high cost of aluminum relative to iron was a factor limiting the use of aluminum in autos; that the direct sale of molten metal would eliminate costly pouring, cooling, handling, transporting, rehandling, and remelting. But no one had attempted to transport molten metal from a smelter to a foundry and there was considerable scepticism as to whether it was feasible.

The first contract was entered into February 7, 1950. We established a pilot line operation about ¼ mile from the Reynolds plant at Jones Mills and conducted extensive tests.

They proved successful and we entered into a production contract on July 23, 1952, covering the purchase and sale of molten metal for a five-year period from January 1, 1954. We built a production foundry of sufficient capacity to handle the output of one potline—about 40 million pounds a year.

We have made no outside sales of castings produced at this plant since 1956. Sales prior to 1957 were largely

S. E. Skinner

"In 1959, GM's purchases of (aluminum) pig, slab and molten metal amounted to 34,285 tons."

to Chrysler Corp. for defense projects. Orders for these castings have been cancelled as Chrysler's defense commitments have been adjusted.

I would not say the Jones Mills operation has proved as successful as we had hoped it would—due mainly to the fact that the plant is rather far removed from the manufacturing facilities which use the castings, resulting in abnormal shipping costs.

On June 22, 1959 we served notice that we desired to terminate the agreement effective June 30, 1960. This does not mean that we plan to discontinue the operation, but merely that we desire to be relieved of the minimum "take" requirements for the time being.

Our contract with Reynolds Metals for delivery of molten metal at Chevrolet-Massena was entered into on February 13, 1957. We are obligated to purchase enough molten metal to manufacture 50% of the aluminum transmission parts and 25% of the aluminum pistons required by Chevrolet, subject to a maximum of 75 million pounds a year. The contract will run until May 31, 1964, subject to renewal at our option for five more years, and thereafter until terminated by either party on one year's notice.

A New Casting Process

The foundry at Massena is currently committed to produce aluminum castings for the Corvair, particularly engine blocks and heads. These are very complicated castings not heretofore produced in the U.S. (see MM, July '60, p. 38).

The low-pressure permanent mold process was originally developed in England for casting aluminum beer barrels. We purchased license rights and machinery from Karl Schmidt of Neckarsulm, Germany, a licensee of Alumasc Ltd. of Northamptonshire, England.

The process differs radically from standard permanent mold castings, in which the average yield is about 60%. In the low-pressure method, metal is forced into the mold from the bottom by air pressure. Average yield is about 98% as a result of the elimination of risers.

Some advantages of the low-pressure technique include:

1. High density structure virtually free from porosity and shrinkage.
2. High yield, with savings on cost of removal and subsequent remelting of large gates and risers.
3. High productivity — automatic fill and hydraulically actuated molds permit more effective use of manpower.
4. Low equipment costs—lower than die casting; comparable to permanent mold.
5. Clean castings—sealed furnace and underpouring of metal results in castings that are relatively free of oxides.

In 1959 the Massena foundry produced 13,521,000 pounds of castings, all of which were shipped to the Chevrolet Division. Approximately 72% of the current tonnage represents engine blocks and heads for the Corvair.

Molten Metal From Alcoa

On November 30, 1959, we entered into a contract with Alcoa under which deliveries of molten metal are expected to begin on July 5, 1960, for a term ending June 30, 1962 and thereafter, until terminated by either party on six months' notice.

Central Foundry Division is obligated to purchase from Alcoa's Warrick Works 50% of the aluminum requirements of the Bedford plant, subject to a limitation of 6 million pounds a month. Independent contract carriers will deliver molten metal in covered flasks about 115 miles to the Bedford plant. Experience at Jones Mills and Massena has shown that it is feasible to transport molten metal for greater distances than was originally thought.

The price of molten metal will be the average delivered list price of 99.5% aluminum pig during the preceding calendar month; less 3.325 cents a pound when such average delivered list price is the present 24.7 cents a pound; and increased or decreased by one-tenth of the amount by which such average delivered list price at the time of delivery shall be greater or less than 24.7 cents.

The Bedford foundry has operated almost exclusively as a supplier to other GM divisions, and has sold very little (from 0.1% to 1.3% of its output) to others. It is not expected that the pur-

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Q. **What are the two forms of standard aluminum alloys and how are they used?**

A. The two forms of standard alloys are (1) "Common alloys" (or work-hardened alloys) and (2) "heat treated" alloys (or strong alloys). The mechanical properties and workability of these alloys vary widely, the common alloy being most easily formed and the heat treated alloys having greater strength. The common alloys are used to manufacture products that are produced by fabrication methods such as brake pressing, drawing, spinning or hand forming. The heat treated alloys are used where strength is of greater importance, such as in the aircraft industry.

Q. **What do the numbers and letters in aluminum alloy designations stand for?**

A. Let's take 7075-T6 and 3003-H14 for examples. The first group of numbers—7075 and 3003—identify the alloy composition. The letters T and H indicate the temper. T indicates thermal treatment, H signifies work-hardened tempers (temper qualities resulting from the cold work of non-heat treatable alloys). The number after the letter indicates either a particular thermal treatment ("6" in T6 meaning "solution heat treated, then artificially aged") or a degree of work hardening ("14" in H14 signifying ½ hard).

Q. **What common alloys are most workable? What alloy is recommended for greater strength?**

A. The most workable alloys are 1100 and 3003. The greatest majority of press room products are made from these. Where greater strength is required a magnesium alloy such as 5052 is recommended.

Q. **What is meant by "elongation"? What has elongation to do with an alloy's workability?**

A. Elongation is the quality of the metal that permits stretch or deformation without fracture. The workability of an aluminum alloy is in relation to its elongation. For instance, one of the reasons why it is possible to deform 1100 alloy to a much greater extent than 5052 is because the elongation of 1100 is greater than that of 5052. In the annealed condition, 1100 has an elongation of about 30%, 5052 has an elongation of about 20%. As cold work increases, the workability of 5052 drops off more rapidly than that of 1100. Therefore, in a sense, elongation is a measurement of workability.

Q. **Can 5052 be fusion welded? If so, what process is recommended and what strength of weld can be expected?**

A. 5052 can be successfully welded by all welding processes used to weld aluminum. However, the use of the inert-gas shielded arc method employing either the tungsten electrode or the consumable aluminum electrode wire is recommended. The tensile strength of the weld will be comparable to that of the parent metal in the annealed condition.

Q. **What is meant by "tooling too close to the borderline" and how does it result in scrap increases?**

A. "Tooling too close to the borderline" is failing to allow sufficient margin for the workable limits. For instance, suppose you are tooled up to work alloy

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3003. This alloy may have a commercial elongation value between 23% and 30% and you find it listed at a nominal 25%. If you are tooled to manufacture an article based on a 20% elongation of 3003 (below the minimum of 23%), chances are good you'll come out with shop scrap of only ½ of 1%. But if this same article is tooled on a basis of 28% elongation (close to the limit), you'll probably have shop scrap as high as 5% to 8%. The latter is tooling too close to the borderline. The one way in which high shop scrap can be reduced to a minimum is to tool for an article well below the critical or borderline area.

Q. Can I draw a circular cup from embossed specialty sheet?

A. Yes, but pattern distortion will always occur to some degree. Best results are obtained with stucco or leather grain patterns, since they show effects of distortion less than other patterns. When drawing embossed sheet, allow a die clearance sufficient to accommodate the thickness of the embossed product rather than the designated thickness, which is metal gauge before embossing. The total reduction should be limited to 30 per cent or less.

Q. Which alloys take the best to anodizing and why?

A. Generally speaking, the purer the aluminum the brighter and clearer the anodic coating. In other words, different aluminum alloys tend to produce varying color reflections from the anodic coating. The alloying constituent used will determine the color, and the anodizing time will determine the depth of color. As an example, 1100, being commercially pure aluminum, will produce a relatively clear, bright and pleasing anodized finish; whereas, 3003 tends to show a brownish color after anodizing due to the presence of manganese as an alloying constituent in the metal.

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George Sall Metal Co., Inc.

chase of molten aluminum from Alcoa will in any way change its historical distribution pattern.

If over-the-road transport of molten metal for substantial distances proves economically and technically feasible, there should be a substantial growth in the use of this commodity by other aluminum fabricators, and GM will have made a real contribution to the development of the aluminum foundry industry.

GM To Sell Castings?

It has been suggested that recent advertisements of Central Foundry Division have caused some concern among small companies in the aluminum fabricating business. The theme of all of this advertising is the pioneering of new markets and the development of new applications, which create new growth opportunities for every fabricator, large or small.

We see no reason to believe that there will not be increased use of aluminum in automobiles in the future, which should benefit everyone in the industry. Continual and imaginative experimentation for seeking out new applications and substitutions will be necessary, however, and the efforts of General Motors will be directed toward developments that promise to bring greater value and improved performance to motor vehicles.

That concluded Skinner's prepared statement. The interrogation period was very brief. Here are a few excerpts:

Yates. Does your molten metal contract with Alcoa require you to take a minimum amount?

Skinner. The contract does not require any minimum amount (but) we have to take 50% of our demands at the Bedford Foundry. If our demand is nothing then we would not have to take anything.

Yates. What about the future? Other foundries expressed alarm at the possibility of General Motors going into the casting business. Do you contemplate Central Foundry Division will continue to grow and will compete with other foundries?

Skinner. I think that the advertising probably exaggerated the situation and understandably made some people concerned about what we were going to do.

The reason for the ad was primarily to let everyone in the industry know that Central Foundry—which had been prominent in the ferrous field, and particularly in the development of new methods and new processing—was now in the aluminum business, and would work on new products and new methods for the improvement of the casting industry as a whole.

That will take a lot of doing, and only if we do something like that would we be in any greater participation out of Bedford than we have been.

Dalmas. Mr. Chairman, I think it might be interesting if Mr. Skinner would take one minute in stating the security measures they use in transporting the (molten metal).

If the Truck Turns Over . . .

Skinner. Part of the development was to make sure that all concerned, and particularly the state highway people, would be assured of no additional hazards on the highway. A lot of work has been done on that. The large ladle, which holds some 11,000 pounds, is heavily insulated and is covered tightly and completely secure from any spillage or leakage, even if there should be an accident to the truck itself.

Dalmas. The truck could turn over but the ladle would still be intact? There wouldn't be any possible way to open it?

Skinner. That is correct.

That ended Skinner's testimony, and Yates called the next witness.

Extruders to Blame for Price Squeeze; Producers' Exports Must Meet Local Prices; Alcoa's Credit Terms Are Uniform

L. P. Favorite — Aluminum Co. of America

The second primary aluminum producer to present its views to the Committee was Aluminum Co. of America. Lewis P. Favorite, Alcoa vice president in charge of product sales and commercial research, started his rather lengthy prepared statement with an affirmation of Alcoa's confidence in the continued growth of the aluminum industry.

This growth, he said, will benefit non-integrated fabricators because of: 1. continued broadening of aluminum's markets; 2. an abundant supply of aluminum; and 3. freedom from restraints on entry into fabricating operations.

With respect to the first point, Favorite noted that Alcoa's massive research, development and promotion efforts have played an important role in broadening the demand for aluminum. To emphasize his second point, he pointed out that about one million tons of domestic primary aluminum capacity has been constructed since 1945 and that another quarter million tons is under construction.

Domestic demand for aluminum last year was 24% higher than it was in 1955, he added, while capacity in the U. S. had grown 70% in the same period. Primary capacity has also been boosted in other countries — particularly in Canada where more than 200,000 tons of capacity, a 33% increase, has been installed since 1955.

On his third point, the Alcoa man saw "every reason to expect that the history of entry of small business into the aluminum fabricating operations will continue." Encouraging this trend are technological developments such as compact "packaged" mills which will reduce the investment needed to enter the industry.

Sell Hot Metal Because . . .

With this background completed, Favorite took up the topics of immediate interest to the Committee. The first was molten metal contracts. Alcoa didn't get into this phase of the aluminum business until 1959, even though one of its competitors (Reynolds) had a molten metal contract dating back to 1952. All molten metal sales were going to auto makers, he added, and Alcoa had every intention of protecting its position as a supplier to this growing market.

Therefore, when General Motors asked for molten metal bids last year, Alcoa submitted a bid and obtained a contract to supply molten metal to GM's foundry at Bedford, Ind. The metal was to be supplied by Alcoa's new Warrick, Ind., works, construction of which had been begun in 1956, then slowed down due to the recession, and finally halted in June 1959. The molten metal contract with GM "provided the impetus" for completion of the smelter, Favorite pointed out.

He then addressed himself to the "alleged price squeeze," which the Aluminum Extruders Council had earlier blamed on the primary producers (see MM, June '60, p. 43). Favorite agreed that there is a narrow spread between the price of soft alloy extrusions and that of pig or extrusion billet.

"The cause, however, does not lie with Alcoa," he asserted. "Rather, Alcoa is a victim of the situation."

As competitors continued to quote ever lower prices on soft alloy extrusions, he explained, Alcoa had to meet those prices. And as the lower prices became more prevalent, Alcoa revised its published prices to reflect the lower levels. Even lower prices are now being

Engineering laboratories at the new Convair (Astronautics) plant, San Diego. All exterior aluminum is protected against atmospheric staining and oxidation with a clear, colorless coating of Butyrate lacquer.

WEATHER-RESISTANT BUTYRATE LACQUERS PRESERVE THE NATURAL BEAUTY OF ALUMINUM

Factory-applied coatings of Butyrate lacquer provide long term protection for outdoor aluminum.

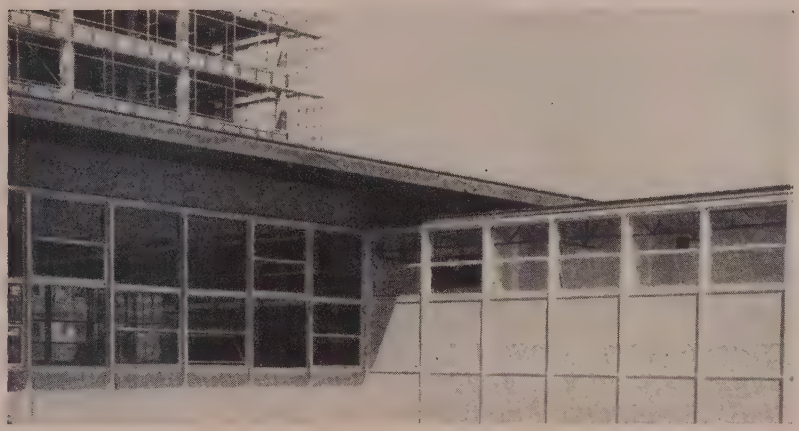
Clear and colorless, Butyrate lacquers won't yellow, even under prolonged exposure to sunlight. They withstand oxidation and discoloring...have high strength and flexibility...are little affected by salt spray or temperature change.

Aluminum surfaces, when protected with Butyrate lacquers, require little in the way of cleaning and maintenance. Usually, the action of rain alone will keep the finish clean and attractive.

This combination of features plus resistance to mortar and plaster staining makes Butyrate lacquer especially advantageous for use on outdoor architectural aluminum...siding, spandrels, curtain walls.

Butyrate lacquers are easy to apply by spray or dipping. A single coat provides excellent protection. They are available from lacquer manufacturers in all parts of the country.

An informative 15-minute, 16mm. sound color film has been produced especially for viewing by those who design in or specify aluminum for outdoor use. Would you like to see it? See below.



Butyrate lacquer, applied immediately after fabrication, protects the aluminum-framed sections, manufactured by Metalco, Inc. of Emeryville, California, from mortar staining and abrasion during erection and from weathering afterward.

The finest lacquers for aluminum are made with

Eastman BUTYRATE

ALUMINUM FABRICATORS!

Take these steps to get the complete story on preserving exterior aluminum surfaces.

1. Send for Eastman's catalog on Butyrate lacquers for aluminum. It tells you how these lacquers are effectively preserving exterior aluminum surfaces in all parts of the country.

2. Check Sweet's Industrial Construction File, Sweet's Architectural File, or see 15-M of the A.I.A. Alphabetical Filing System for specification details.

3. Send for sound color film. Please indicate the date you plan to show the film and an alternate date.

4. Write for names of manufacturers of Butyrate lacquer in your area.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; Atlanta; Chicago; Cincinnati; Cleveland; Detroit; Framingham, Mass.; Greensboro, N. C.; Houston; New York; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

quoted by some competitors, he said.

Alcoa's share of the soft alloy extrusion market has dropped 40% since 1950, he added. In the same period, the number of independent extruders had grown from 33 to 127 in 1959.

Alcoa — and presumably other primary producers — is losing ground as a supplier to the non-integrated extruders, as well. "Using the Alcoa average of the years 1955 and 1956 as the base of 100," he explained, "Alcoa's shipments of pig and ingot to non-integrated extruders were at a level of 78 in 1957, 48 in 1958, and 38 in 1959. . . . I can assure you that we are not happy about losing this business."

Although Alcoa's share of the soft alloy extrusion business has slipped badly, and although its profit in this field leaves a great deal to be desired, the company is not yet prepared to abandon the business completely, Favorite declared.

Export Scrap Because . . .

He then defended Alcoa's exports of aluminum scrap with the following reasoning: Foreign countries represent enormous potential markets for aluminum; Alcoa hopes to "carve a niche" in international markets, but to do so it must sell products that are in demand; scrap aluminum is in heavy demand in Europe; Alcoa generates scrap in its own fabricating operations "which it finds difficult or uneconomic at times to absorb in its system"; hence, Alcoa is "selling some of this and other scrap abroad."

Noting that the Committee had invited Alcoa to give its views on "accelerated mergers," Favorite declined to comment because one of the company's recent acquisitions "is the subject on a court proceeding instituted by the Department of Justice," while another merger is being investigated.

Alcoa's expansion plans were the final subject of Favorite's statement. He informed the Committee that even though the industry's capacity exceeds present demand, Alcoa is installing 207,000 tons of additional capacity "which can be brought into production rapidly when demand warrants."

In addition, preliminary work now underway will eventually permit a 50,000-ton expansion of Alcoa's Badin (N. C.) smelter. Other smelters could be expanded, and Alcoa could also build "several additional large smelters" similar to the 175,000-ton Warrick Works.

In the foreign field, Alcoa has signed an agreement with the Suriname government in South America to proceed with the Brokopondo Development, under which Alcoa will build and operate a 150,000-kilowatt hydroelectric installation, a 60,000-ton primary smelter and, eventually, an alumina refinery. Total cost to Alcoa will be about $150 million.

L. P. Favorite

"Just when we decide to go into the siding business the price is reduced from $24 to $21.95 . . ."

In conclusion, Favorite reminded the Committee that in addition to the "several hundred" non-integrated fabricators of aluminum, the industry consists largely of some 20,000 companies that use, not pig or ingot, but mill products such as sheet, extrusions, tube, etc. These firms look to Alcoa and others for their material.

"Therefore, Alcoa's policy is to try to keep its production facilities for both metal and mill products ahead of demand to assure all types of customers that there is an ample supply of whatever products they need."

That concluded Favorite's statement. Chairman Yates opened the interrogation by asking if Alcoa had received any offers for hot metal contracts from companies outside the auto business. Favorite revealed that there had been only one— very recently.

Yates then wanted to know what Alcoa's reaction would be if the independent extruders sought a hot metal contract with the company. "We would certainly give it thorough study and take it under consideration," replied the witness.

To Sell Abroad . . .

The Chairman then brought up the subject of prices of metal sold in foreign markets. Here's his question and portions of Favorite's testimony:

Yates. Your overseas price varies from country to country?

Favorite. It can.

Yates. Is your price in Western Germany the same as Reynolds', 23½ cents?

Favorite. I would say it was, because you have to sell your product at the prevailing prices in those countries.

Yates. Why is it lower than it is here?

Favorite. I have no idea. The price is not established by American producers. It's established over there, probably by producers in the area. We could not sell our product for more than what it is sold for in those areas.

Yates. The extruders' witness testified that one of the members of his association was able to buy pig or billet at cheaper prices in Europe, ship it back to this country, and have a lower price than he could buy it for from the Big Three. Is that conceivable?

Favorite. Possibly. We have heard a rumor to that effect. We tried to run it down. We have not found any of our metal being returned.

Yates. Is there a prohibition against your foreign customers selling the metal to customers in this country?

Favorite. No. On the other hand, we make a real effort to sell our metal abroad to companies that are users of the metal.

Yates then switched the discussion to the price squeeze in extrusions. He wanted to know why Alcoa did not raise its prices on 6063 alloy extrusions as much as it did on other mill products. Here's Favorite's reply:

Independents Cut Prices

Favorite. Alcoa publishes its prices, which are public knowledge. We have found that these prices are evidently a starting point from which competitors can start to reduce prices. The independent extruder is the one who has established these lower prices, and we could not sit aside and see this business taken from us by default. We had to meet these prices.

Yates. You think the squeeze is brought about by the extruders?

Favorite. I certainly do . . .

A good example is this: On December 17, 1959 Alcoa announced a price increase on metal and fabricated products, including 6063 extrusions. We hoped that the independent extruders would raise their prices. But in a matter of days, independent extruders were around to some of our customers stating that they were not raising their prices, that they were extending the price in effect before December 17 for the first quarter of 1960.

Finally, from all the rumors we accumulated from various sections of the country, that became a pattern. We had to follow that pattern in order to sell our products.

Yates. Do you have commodity prices?

Favorite. Yes.

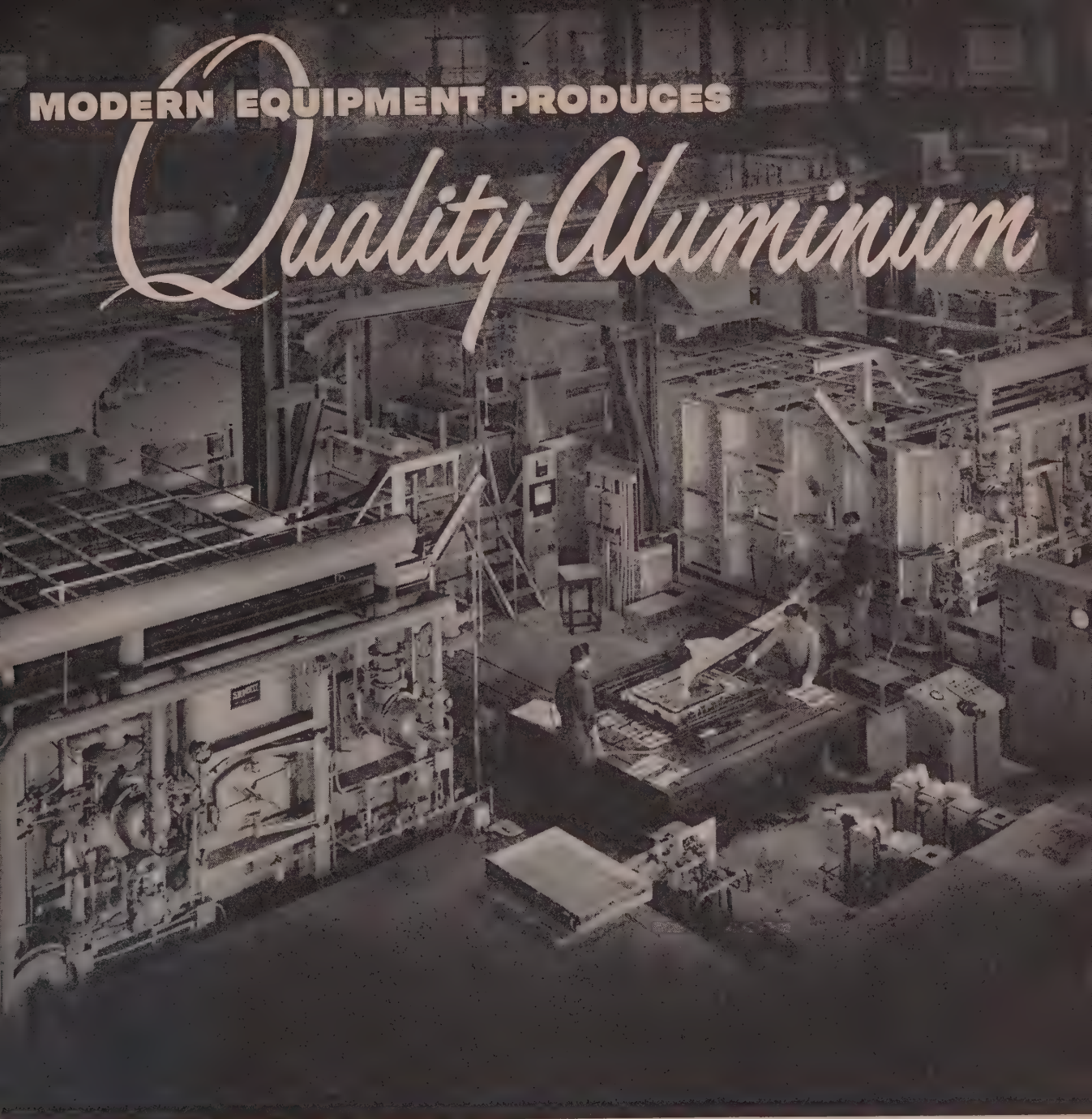
Yates. Are these lower than the published prices?

Favorite. Yes, they are.

Yates. Why?

Favorite. Because we are trying to

MODERN EQUIPMENT PRODUCES *Quality Aluminum*

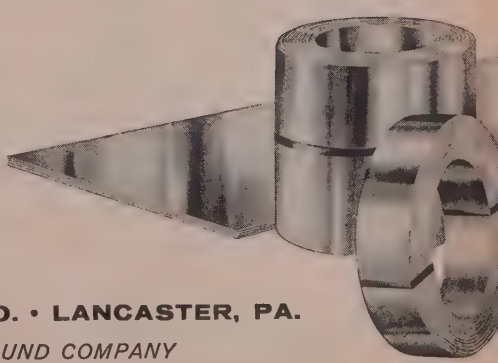


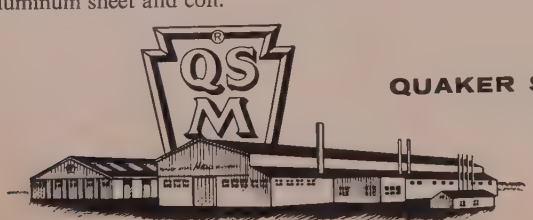
Inside QSM's new cast house the most advanced equipment and metallurgical techniques have been combined to produce aluminum alloy rolling ingots of exceptional quality.

For productive efficiency two custom-built Swindell-Dressler melting furnaces have been set up with two companion holding furnaces in tandem. Molten metal is transferred directly from melting to holding furnaces after the industry's most modern fluxing has been completed.

As a final assurance of top quality, the melt is held in a "tranquil bath" until filtered at a controlled rate through glass cloth screening into the molds.

The resulting ingots will meet QSM's exacting standards and insure you of quality aluminum sheet and coil.





QUAKER STATE METALS CO. • LANCASTER, PA.

A Division of HOWE SOUND COMPANY

Mill Producers of Aluminum Sheet and Coil

enter a market or enlarge a market. We are competing with other materials—steel, glass, plastics, other materials.

Yates. When you enter the truck trailer industry, for example, and have a commodity price which may be four cents below the general published price, does it prevail for as long as a year?

Favorite. Yes, it might prevail for several years . . .

Yates. Does Alcoa offer free warehousing to any customers?

Favorite. No.

Yates. Does it offer advertising allowances?

Favorite. We have an advertising program in which are advertising plans for our customers. That is only true in certain areas, but all customers in those areas are offered the same plan.

Yates. Do your credit terms vary from one customer to the next?

Favorite. No, our credit terms are the same for all customers.

Yates. Mr. Sugar (Alsco, Inc.) testified to the effect that Alcoa did have a deal with five companies for the sale of its siding and that they had an agreement whereby they were to receive 16% of sales as a profit. It there such a contract?

To Sell Siding . . .

Favorite. When Alcoa decided to go into the siding business we decided that we would promote the sale of siding through established building product distributors. We have signed up with five nationally known distributors of building products and are selling them Alcoa aluminum siding at a price which was established by the independent rollers of siding. We have not cut that price.

We offer these distributors a functional discount, and that is all. Our recommendation to them is to sell it on the same basis as the other independent fabricators of siding.

When we decided to go into the aluminum siding market, the price was 24 dollars per square. Before we announced that Alcoa was entering the siding business, although the rumor had leaked out, the price had dropped to $21.95 per square.

It certainly is a coincidence that just when we decide to go into the siding business the price for siding is reduced from $24 to $21.95. . . .

Yates. What conclusion do you draw from that? Were they trying to keep you from going into business?

Favorite. I think a conclusion could be reached to that effect.

Yates. Do you warehouse the product for the distributors?

Favorite. They send the orders to us, and we bill them individually.

Yates. Do they warehouse any of your product?

Favorite. Yes, they do. Others are direct shipped.

Yates. What credit terms do you have?

Favorite. Our terms with them are net cash, 30 days from date of invoice.

Yates. Are there any variations?

Favorite. No, there would be no variation in any of the five.

Yates. In Mr. Sugar's testimony he says: "Mastic told me the credit terms they could receive was anything they wanted—90 days or 120 days if they wanted it."

Favorite. That is not true.

Yates. Is this an unusual way for Alcoa to market its product?

Favorite. Not necessarily. We felt that here were five companies well established in the building products field. They had a ready-made sales force that could start selling this product immediately. Alcoa would have had to train a sales force.

Yates. Do you do this in the sale of any other products?

Favorite. Yes. Electrical conduit is sold through jobbers.

Yates. Mr. Sugar also testified as follows: "I had been told by one of the Alcoa people the program is to give their distributors that mark up regardless of what the price is."

I assume that is the 16% profit to which they referred. What is the functional discount to which you refer?

Favorite. I would prefer not to mention that if possible. . . . We have a functional discount that is the same to all five distributors. . . .

Yates. The discount is from the price at which the distributor buys the siding from you.

Favorite. And only that.

Yates. So if the distributor drops the price, his discount will permit him a lower return?

Favorite. That is right. . . .

One Price At a Time

At this point the questioning was taken over by Victor Dalmas, counsel for the minority. Dalmas wanted to know whether Alcoa had certain base prices for all its products. The witness said that most mill products do have base prices, to which extras are added such as tolerance extras, finishing extras, quantity extras, etc.

Dalmas then wanted to know what Alcoa would do if it had to meet a lower price on a specific product—say, a standard size sheet in a standard gauge, etc. "Would you go out and meet that price while sheets of other thicknesses and sizes remained the same, or would you make a general cut in the base price of sheet?"

The witness replied: "We would not make a general cut in the base price. We would meet an individual competitive situation at an individual customer's plant."

That seemed to satisfy Dalmas, and concluded Favorite's testimony. The chairman called the next witness.

Ford's Use of Aluminum Fell Short of Predictions; Hot Metal Deal Did Not Reduce Purchases From Small Firms

J. L. Cameron — Ford Motor Co.

The past, present and future use of aluminum by Ford Motor Co. was described by the next witness, James L. Cameron, director of supplier relations at Ford. Cameron was appearing on behalf of Earl G. Ward, purchasing vice president, who had appeared at the 1957 hearings of the Committee. Cameron read Ward's brief prepared statement, which is summarized as follows:

My statement in 1957 was to the effect that in 1954, our use of aluminum products for automobiles and trucks (excluding tractors) was about 56 million pounds per year. It was estimated that by 1959 our demand for aluminum products for automobiles and trucks would be about 127 million pounds per year, an increase of 71 million pounds per year during the five year period.

Our actual experience in 1959 resulted in a total usage of approximately 102 million pounds of aluminum—more than 80% over the total for 1954.

During 1960, it is estimated that our use of aluminum for automobiles and trucks will decline slightly to 94 million pounds. The principal reason for the anticipated decline is the outstanding public acceptance of our new Falcon, which contains less aluminum than the conventional Ford.

The 1958 Ford model cars averaged about 48 pounds of aluminum. The comparable figure for 1959 was 57 pounds. Our 1960 Fords average 60 pounds of aluminum. The Falcon, however, uses an average of only 40 pounds, although the percentage of aluminum to the total weight of the vehicle slight-

If you want more than just a tube

Imagination . . . research . . . new product pioneering and development . . . are these some of the things you look for in a supplier?

If they are . . . and if your company uses drawn or extruded aluminum tube, then you'll find that Wolverine Tube is exactly the kind of supplier you want.

In addition to meeting the present aluminum needs of its customers, Wolverine Tube is also working steadily toward the future. Wolverine engineers and technicians have the industry's most complete Research and Development facilities right within their own company. They are constantly delving into new types of tubing and working with new metals and alloys.

Inflatable tubing, so flat it resembles a ribbon . . . the ability to make unusually long lengths of tubing in special metals . . . tubing and shapes made from columbium, tantalum and molybdenum . . . these are but some of the new things coming from Wolverine's R&D program.

If your management is taking a long look at tomorrow . . . and beyond . . . then Wolverine Tube can help bring your plans to fulfillment . . . particularly in the field of tubing and heat transfer. Wolverine's experience, engineers and research and development facilities are ready to help solve your problems.

May we hear from you soon?

Tomorrow's metals are being worked at Wolverine Tube today

WOLVERINE TUBE
DIVISION OF
Calumet & Hecla, Inc.
DEPT. D, 17262 SOUTHFIELD RD., ALLEN PARK, MICH.

Manufacturers of Quality Controlled Tubing

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

ly exceeds that of the Ford.

Although we expect to continue to sell substantial numbers of compact cars in 1961, we nevertheless anticipate a further increase in our use of aluminum. Within the next five years we foresee approximately a 40% increase over the current rate of consumption.

This would represent perhaps another 40 million pounds annually. Many variables, including future production of vehicles, could affect this expectation substantially in either direction.

In summary, the factors influencing the trend toward increased use of aluminum by our company have not changed materially since my appearance before the Committee in 1957, and we at Ford expect the continuation of this growth.

That concluded Ward's formal statement, but Cameron volunteered some additional information concerning the role of small businesses in supplying aluminum parts for Ford vehicles in the period since the company's molten metal operation went into effect at Sheffield, Ala.

Small Firms Held Their Own

Our purchase records indicate that small suppliers of aluminum parts have held their own in the current (1960) model year compared with 1957, the model year which immediately preceded initial operations at Sheffield. Looking ahead to 1961 it is expected that these suppliers will substantially improve their position, on a percentage basis and on a dollar basis.

The dollar volume of our purchases of aluminum parts from suppliers with less than 500 employees was about $8 million during the 1957 model year, or 16% of total aluminum parts purchases from all suppliers. In the current model year, dollar volume of such purchases will approximate $7.5 million, or 21%. For the 1961 model year the volume is expected to increase to $11 million, or 25%.

J. L. Cameron

"In 1960 our use of aluminum in autos and trucks will decline slightly to 94 million pounds . . ."

With regard to suppliers with less than 100 employees, the figures are as follows: In 1957, the dollar volume of purchases from these firms was about $3 million, or 6% of total purchases. In 1960, dollar volume will be about $3.8 million, or 11%; and in 1961 the forecast is for $6.3 million, or 14%.

It is clear, therefore, that these smallest firms have substantially improved their position during the period of our Sheffield operations.

Smaller firms have continued to participate so heavily in our purchasing because we have found that many items, particularly low volume and specialty items, are well suited to the flexible and efficient small fabricator. Despite the fact that automobile manufacturing is a mass production industry, there has always been a great need for such specialization and prompt adaptability on the part of suppliers, and smaller firms can usually best meet our requirements in these fields.

With Cameron's prepared statement completed, Yates opened the very brief interrogation with this query: "Does your hot metal contract supply all your needs for aluminum?" Cameron replied:

Use Secondary Ingot at . . .

Cameron. It does not. We have two other substantial operations that require aluminum. We have a plant in Sandusky, Ohio, that uses large quantities of secondary aluminum. We have a plant in Rawsonville, Mich., that also uses large quantities of secondary aluminum. Also, we have some minor requirements in our steel mill and elsewhere.

Yates. Do you buy all your aluminum from one producer or from all of the producers?

Cameron. We buy from a number of suppliers on a competitive basis.

That ended Cameron's testimony, and the Chairman called the next witness.

Kaiser a Small Factor in Soft Alloy Extrusion Business; Sees Aluminum Industry Sales of 4.2 Million Tons by '65

D. A. Rhoades — Kaiser Aluminum & Chemical Corp.

The final witness at these hearings was D. A. Rhoades, president of Kaiser Aluminum & Chemical Corp. Before discussing matters of immediate interest to the Committee, Rhoades offered a brief review of conditions in the aluminum industry since the Committee's first hearings in 1955. Here is a summary of his statement.

At the previous hearings, the Committee was interested in whether or not adequate supplies of primary aluminum would be available to small business. Between December 31, 1955 and March 31, 1960, the U.S. aluminum industry added 800,000 tons of primary capacity. Over 200,000 tons were built by Kaiser.

Of the total of about 2.4 million tons of capacity in the U.S., about 340,000 tons are idle. This does not include 240,000 tons of capacity which is under construction and nearly completed, making a total of about 580,000 additional tons to meet increased demand.

A second issue raised in previous sessions was the then relatively small number of primary producers. Today there are four new primary producers in the U.S., making a total of seven.

With respect to non-integrated companies, government records show that of total industry shipments of 1.7 million tons of fabricated aluminum in 1959, 433,000 tons, or about 26%, were shipped by non-integrated firms. This compares with 15% in 1950—a very favorable comparison when we consider that major companies such as Olin, Revere, Harvey, and Anaconda were classified as non-integrated in 1950 and as integrated producers in '59.

Shipments by non-integrated companies increased 270% in the decade, compared to an increase of about 93% in shipments by integrated companies.

Rhoades then turned his attention to current issues—specifically the aluminum extrusion industry. He noted that Kaiser has historically concentrated on supplying primary aluminum to independent extruders; that its extrusion sales have been aimed at hard alloy products, which few independents are equipped to produce; and that other Kaiser efforts have been aimed at development of new products such as extruded electrical conduit.

Excluding electrical conduit and hard alloy shipments, our participation in that portion of the market competitive with non-integrated extruders is less than 4%. By contrast, our sales of primary metal to non-integrated ex-

...WITH MARKET-MAKER PROMOTIONS
directed to your customers

Millions of *your* customers will see the advertising and promotion Alcoa conducts to help you "cook up a better batch of profits"! Whether you fabricate Alcoa® Aluminum cookware, hardware or boats . . . sporting goods, furniture or major appliances, there's an Alcoa Market-Maker promotion to help you sell your product.

Here is just a partial list of avenues used by Alcoa to help you sell. Alcoa TV commercials appear regularly on two network TV programs. Radio is used to reach customers when they aren't watching television. Magazines—both consumer and trade—and many other promotional tools for industry support and direct customer support to help you sell your products. There is an element in Market-Maker promotions that will fit your particular selling need.

Brand-conscious consumers know and respect the Alcoa label. And alert retailers constantly feature the label in their advertising and in-store displays to tell customers about the benefits of aluminum products.

If you aren't already making full use of Alcoa Aluminum in your manufacturing operations—or would like more information about Market-Maker promotions and Alcoa's label program, here's your invitation—write Aluminum Company of America, 2076-H Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and "Alcoa Theatre," alternate Mondays, NBC-TV

truders are several times our total sales of extruded products in this market.

With respect to extrusion prices, we are a relatively small factor in the extrusion industry. But to the limited extent that we do participate in this industry, we must price our products on the basis of prevailing conditions.

At the time of the 1955 hearings, production of the non-integrated extruders totaled some 200,000 tons. In 1959, this had increased to 288,000 tons. Government figures show that the non-integrated extruders' share of the market has held steady at about 54%. During this same four year period, the number of non-integrated extruders increased about 20%.

It should be kept in mind that Olin, Revere, Harvey and Anaconda have, between 1955 and 1959, been reclassified as integrated producers. Therefore, the actual growth of independent extruders is even greater.

The tremendous growth of aluminum usage since World War II has been accomplished, in great part, by intensive sales, advertising, promotion, research and market development by the entire industry. These efforts, together with the advantages of aluminum, have resulted in the development of new applications, and have opened new markets in competition with other materials — benefiting the entire industry, both small business and large.

4.2 Million Tons by '65

Our sales forecasts indicate that total aluminum shipments in the U.S. in 1965 will be about 4.2 million tons—a very substantial increase over shipments of about 2.5 millions tons in '59.

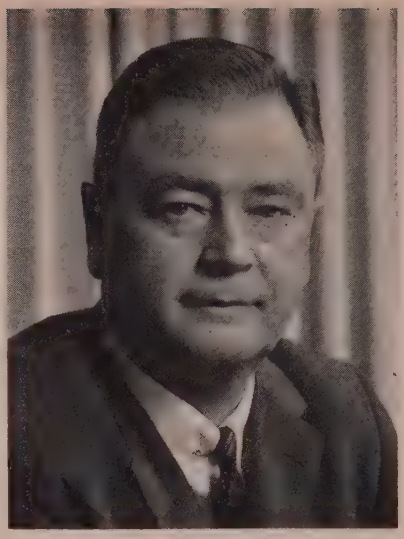
Development of this increased market will require determined efforts on the part of all members of the industry, and will be to the advantage of large and small producers alike. We feel that non-integrated companies will continue to have an important position in the aluminum industry of the future.

Chairman Yates opened the questioning with a few queries about Kaiser's position in the molten metal business. Rhoades replied that Kaiser has no molten metal contracts, but has discussed such contracts with auto makers and will continue to do so. When asked about scrap exports, Rhoades said that Kaiser does not export scrap.

Yates then asked if Kaiser makes aluminum siding. Here is Rhoades' reply and most of his ensuing testimony:

Rhoades. We do not make siding. We sell coils to other fabricators who fabricate and sell the siding to the ultimate consumer.

Yates. Alcoa has entered into contracts with five distributors for the sale of Alcoa siding. Do you feel that your



D. A. Rhoades

"To be competitive with tinplate, commodity prices (in aluminum) are available to any can maker . . ."

company will have to do the same in order to meet this competition?

Rhoades. As of now, I could not make a positive statement to that effect. We are trying to help the manufacturers of siding to whom we sell. We are trying to give them some national support in connection with advertising.

Yates. Mr. Starr of the Aluminum Extruders Council testified about a price squeeze. He thought that the extruders were being squeezed because the price of 6063 billet had gone up while the price of the extrusions had not gone up correspondingly. Do you have any views on that?

Rhoades. When the price of aluminum was raised in December, the price of 6063 billet was raised also. I believe the price of extrusions was probably raised, too.

Yates. Were they raised at the same rate that other semi-fabricated products were raised?

Rhoades. I could not say specifically that they were. But actually, the published price is not too significant because the price prevailing in the marketplace is what you have to sell against if you want to sell extrusions. Being such a small factor in that business, we sell on a competitive basis, regardless of whether it is the book price or a price below that.

That, I should say, is primarily the result of the non-integrated extruders' prices. I think they are more of a factor in establishing the price than we are because we are such a small part of it.

Yates. Is there a price leadership situation in extruded products as there is in the sale of primary metal? We know that when one of the producers either raises or lowers its primary price, within a few days the other primary producers follow suit. Is this true in extruded products?

Rhoades. Well, possibly there are many price leaders in the extrusion industry because it does not take much to lower the price in an industry. Whatever price is established, regardless of who establishes it, you have to be competitive because you are selling similar products. Customers have not been willing to pay us more than they would pay others for a similar product.

Yates. What happens if a primary metal producer raises the price of a semi-fabricated product? Will the others follow suit?

Rhoades. I think that has occurred. We take a good look at any upward price change in the aluminum industry that affects a product we produce and if the increase seems justified, we follow it. There may have been cases where we did not feel that it was proper, and consequently did not increase our price.

Yates. Did the other price come back?

Rhoades. It would have to if they wanted to share that portion of the market.

Yates. Is this true in the sale of primary metal?

Rhoades. No. I don't know of any case where the price has been increased by one primary producer and the other producers did not follow. . . .

Yates. What is the nature of the credit you give your customers? Does it vary?

Standard Credit Terms

Rhoades. We have standard terms and conditions. . . . We may have 8000 customers. Now to say that everyone of those customers has exactly the same situation with respect to credit—I don't think I could actually say that. But I don't want to intimate here that we sell to different people at different terms and conditions. That is not the case at all.

Yates. You do have standard procedures. And I am sure the standard procedures may vary from customer to customer depending upon the customers own financial requirements and conditions. Is that true or not?

Rhoades. No, that would not be the basis of a variation. Any deviation from standard terms and conditions for a particular customer might be the result of competition. When you run into a situation where a competitor has more favorable terms and conditions with respect to a given customer, if you want to participate in his business it may be necessary for you to meet those terms and conditions.

Yates. Can you give us an example of that?

Rhoades. No, not offhand. I am just

speaking in generalities.

Yates. I know you are. That is why I asked for examples. It has been testified that at least one of the primary producers gives certain credit terms which are more favorable to some customers than to others. And in some instances a primary producer has given warehousing services to his customers. In other words, discriminatory preferences have been given. But you don't know of any in connection with your company?

Rhoades. No, none that create discrimination between customers in the same industry.

Quote Commodity Prices

Yates. Do you have the same type of commodity pricing that the other primary producers have?

Rhoades. Where commodity prices exist, in order to be competitive, we quote commodity prices. . . . There are commodity prices for can stock, for instance. But that is available to any can maker in the U. S. We don't discriminate between the members of a particular industry.

We think there is a large potential for aluminum in the canning industry. But to be competitive with tinplate in that particular field, commodity prices are available to any can maker or the whole can making industry.

Yates. What is your feeling about mergers and acquisitions? Do you think that it is a healthy or an unhealthy situation in the aluminum industry?

Rhoades. I don't think I could answer that in a general way. In some cases it may be a plus; in others it might be to the detriment of certain members of the industry.

I think our acquisition of U.S. Rubber Company's wire facilities was good for the aluminum industry, and good for Kaiser, because we have been trying to increase the use of aluminum in insulated wire.

At about this point, Yates turned the questioning over to Victor Dalmas, who asked Rhoades basically the same question he had previously put to the Reynolds and Alcoa spokesmen. In effect, Dalmas wanted to know how Kaiser would handle a situation in which it would have to reduce the price of a specific product—say, a certain size and gauge of sheet—to meet the competition.

"Do the rest of the items in that particular category remain at the same price or do you reduce the whole group," he asked?

Rhoades replied, in effect, that only that particular product would be reduced in price.

For all practical purposes, that concluded Rhoades' testimony and ended the hearings.

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News Products and People

Aluminium Ltd. Bypasses Bayer Method With New Process

A "basically new process" for the production of aluminum was announced late last month by Aluminium Limited. The Canadian company will build facilities to employ the process at Arvida, Quebec.

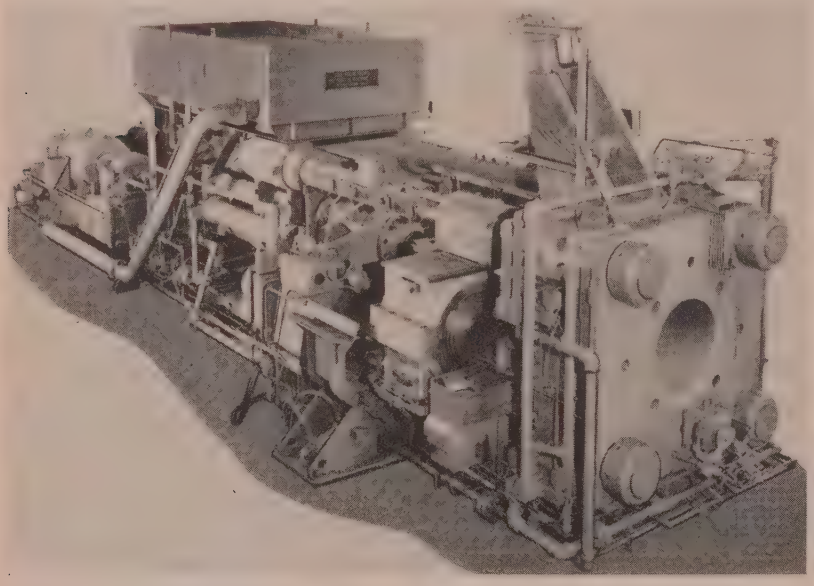
Despite company-owned patents in many countries, Limited gave no details of the process. MODERN METALS learned, however, that the Bayer process, the conventional method of obtaining alumina from bauxite, is bypassed completely. No name was reported for the process which could herald a new low world price for primary aluminum in the near future.

In a joint statement by Nathanael V. Davis, Aluminium's president, and H. H. Richardson, chief technical officer of the company and president of Aluminium Laboratories Limited, the process was described as 10 years in the making. It uses, as its principal raw material, "bauxite of roughly similar grades to that required by the conventional process."

"The new process does not appreciably reduce the large power requirement of the conventional process," Davis said. "It does, however, give promise of substantial savings in other elements of production cost and in the investment required per ton of capacity."

The new facilities will have a capacity of 6000 to 8000 tons of aluminum per year. Capital cost will be about $4 million. Thus, the capital investment amounts to about $600 per ton — perhaps half of the cost of conventional aluminum production facilities. As a result of these savings, MODERN METALS estimates, the process might eventually chop 2½ to 3½ cents a pound off the price of raw aluminum.

The new facilities are expected to be in operation within two years, according to Davis.



Double-Tooled Press Improves Extrusion Quality

A 2600-ton extrusion press has been installed in the new plant of American International Aluminum Corp., 495 Brokaw Road, San Jose, Calif. The press was supplied by Youngstown Foundry & Machine Co., Youngstown, Ohio.

The press, said to be the newest development in the extrusion industry, has a completely automatic double die slide and double containers. This allows one billet to be loaded while another is being extruded. With double tooling, the operator can cool tooling without any time loss, which will improve the quality of extrusions, says Youngstown.

This press has a capacity of 1675 tons and is tooled to run 8 by 32 inch billets.

The machine can also be adapted to the extrusion of copper and brass. By adding a few auxiliary components the operator is able to eject "skulls" from the container, and to load billets while copper billets are being extruded.

The new American International plant covers 50,000 square feet; was to begin production in July.

Injection Die Caster Has 1200-Ton Lock-up Pressure

A new 1000-ton, cold-chamber, high-pressure injection type aluminum die casting machine has a 1200-ton lock-up pressure. It weighs 85,000 pounds, and is 8½ feet wide, 26 feet long and 10 feet high.

B & T Die Casting Machinery division of Greenlee Bros. & Co., Rockford, Ill., built the machine, which has four-corner linkage to fully support the die and give the platen exceptional stability. The platens are 5 feet high, 5 feet wide and 1 foot thick. The four tie bars are 8 inches in diameter.

Hydraulic and electrical safety features assure dual control in all areas, says the manufacturer.

Economies Claimed for Extrusion Lubricant

Extrusion die lubricant cost savings of from 50 to 66% are claimed for a powdered concentrate compounded by the Hodson Corp., 5301 West 66th St., Chicago 38, Ill.

Identified as Hodson Aluminum Extrusion Powdered Concentrate, the formula contains "micronized graphite" together with bactericide, fungicide, and jelling, bonding and anti-weld agents.

"These additives will not create occupational hazards to operators, nor will they impair the equipment nor stain finished extrusions," a Hodson executive said. "Extruders have found the compound highly satisfactory for lubrication of the die and coating of the dummy block."

When mixed with the recommended amount of water it results in a full 55-gallon drum of ready-to-use extrusion compound at a cost of a few cents per pound. One extruder reports it uses the formulation for 100% of its operating needs.

G.E. To Roll Its Own Foil for Capacitors

Within a year, General Electric Co. expects to be producing its own aluminum capacitor foil in a new $2 million facility at its Fort Edward, N. Y. capacitor plant. The need for operating economies and improved capacitor quality were the reasons advanced for this move.

To be housed in its own building, the installation will consist of three rolling mills for producing capacitor foil from reroll stock, annealing furnaces, slitters and a roll grinder, together with auxiliary equipment for handling and storing raw materials and materials in process.

The building will also contain offices, a quality control and testing laboratory, and service and storage areas. Since the rolling process requires large

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amounts of water the building will have its own driven well. A 1000 KVA transformer will handle incoming power and a railroad spur and roadway will be built. When in full operation, the facility will make GE completely independent of the aluminum foil industry.

"This new rolling mill represents another step by the Capacitor Department to cushion rising material costs and, through tighter control of materials processing, provide our customers with the highest quality product possible at fair prices," said O. H. Winn, general manager of the Capacitor Department.

The mills, built by Pittsburgh Engineering & Machine Div'n, are 8½ & 21-inch by 38-inch 4-high non-reversing type. They will take .026-inch re-roll stock in coils up to 3500 pounds for rolling to foil thicknesses. Mill speeds, according to Pittsburgh Engineering, will be up to 2000 fpm.

Design features include hydraulically operated roll stands for precise control of roll pressures, a direct drive to each mill for added flexibility of operation, modern strip X-ray equipment with automatic gauge control, and other features necessary to accurate gauge and high quality foil.

Construction of the new plant will start this month with the installation of the first machinery taking place before the end of the year. Foil production is expected to begin about a year after start of construction. When full production is reached it is planned to operate in two shifts a day, five days a week. This schedule will create about 50 jobs in the community.

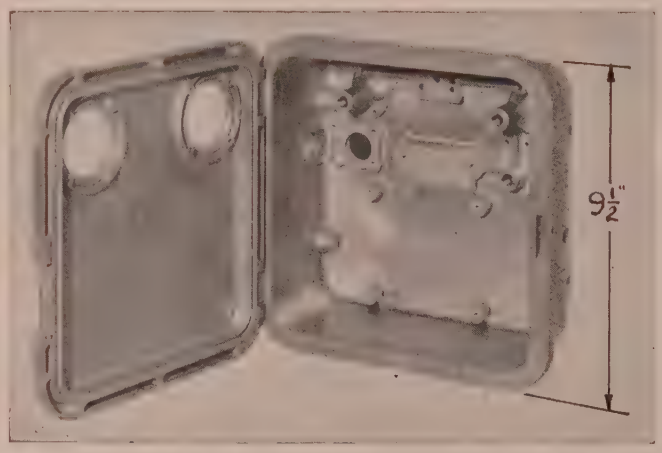
According to GE, studies have indicated that "opportunities exist to improve the physical, chemical and metallurgical properties of capacitor grade foil." The Capacitor Department people believe the new facility will enable them to make "significant contributions to the quality of GE electric capacitors through the use of the improved foil."

Immediate plans are to use the production of the new foil plant to satisfy capacitor needs, but the company said it will explore the possibilities of using high quality aluminum foil in new product developments of other departments.

A fast survey of the capacitor field revealed no great concern on the part of G. E.'s competitors.

"They're big enough to do it," an executive of a large capacitor manufacturer said. "We would do the same thing if we had the financial base that G. E. has."

All executives contacted conceded that the new facilities would improve the profit picture for G. E.'s Capacitor Department, the consensus being that this improvement would probably have no effect on capacitor prices.



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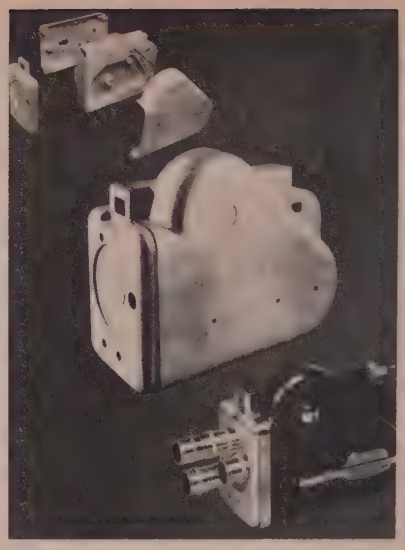


Die Castings Vital To Sound Home Movie Camera

Aluminum die castings are an important part of the first home movie camera with sound. It is a development of Fairchild Camera & Instrument Corp., and is this firm's first consumer product.

The 8 mm, self-contained camera records sound simultaneously with action. The battery assures approximately 800 feet of shooting before recharging, which can be done from an ordinary light socket. A microphone and headset pick up and monitor sound. A companion Cinephonic projector can play back a 400-foot reel, erase, overlay, or record fresh sounds.

Aluminum die castings and screw machine parts are used in both units. Die castings, used for the camera's four largest and most intricate parts, and for the projector's frame, make up the bulk of aluminum used. The 4½ pound camera contains 2½ pounds of aluminum while the projector uses 2¾ pounds.

The picture shows the intricate die cast parts (upper); an assembled view of the castings prior to finishing (center); and the completed camera (lower), with front plate satin finished and lacquered.

55 Aluminum Signs Identify Pittsburgh Bank

Fifty-five modern aluminum signs now identify the banking offices of Pittsburgh (Pa.) National Bank. The illuminated signs were fabricated by Pittsburgh Outdoor Advertising Co. from natural and gold anodized aluminum, supplied by Alcoa. Inset is a plastic embossed triangle, featuring the bank's name in white lettering on an opaque blue background. Trim is gold anodized.

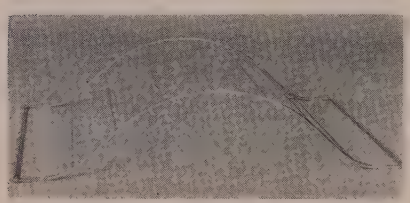
First Mexican Smelter Will Start Up in '62

Plans to construct Mexico's first primary aluminum smelting plant have been finalized by Intercontinental, S. A., a Mexican investment bank, and Aluminum Co. of America.

The $20-million plant will have an annual capacity of 20,000 metric tons of aluminum. It will be located in the State of Veracruz, on a site which can be served by ocean-going barges. Energy for the smelter is expected to come from a government hydroelectric power plant. First production is scheduled in two years.

A new company, Aluminio, S. A., has been formed by Intercontinental and Alcoa to finance, engineer, construct, and operate the smelter, and for the marketing of aluminum produced at the new plant. Alcoa will own 35%, 10% will be owned by European investors, and the remaining 55% will be held by Intercontinental, S. A. and other Mexican investors.

Alcoa will provide technical assistance during engineering, construction, and operating phases of the project.



Lightweight Frame Easier To Handle, Ship

Tradition yields to a modern metal in this tester frame for four-poster beds made by Henkel-Harris Co. Inc., Winchester, Va.

Formerly, all tester bed frames were made of wood, and were either band sawed or bent to shape. There was no standardization as to construction, height of arch, etc. The assembled frames were hard to ship and handle without breakage.

This aluminum tester frame has been standardized in two heights, 17-inch arches for regular poster beds, and 11-inch for the taller beds. They're expected to take care of practically all the tester beds made today.

Aluminum frames are light. One person can erect a complete frame on a bed. After erection, the tester cover can be tossed over the frame like a slip cover is placed over a chair. No fastenings are necessary.

The clear anodized aluminum finish is neutral in color and harmonizes better than colored frames. Aluminum frames are not as bulky as others, Henkel-Harris Co. said.

Plant Move Will Aid Surge in Beryllium Work

Wyman-Gordon Co., Worcester, Mass., a leading manufacturer of forgings for defense and other industries, will transfer its Prex Corp. facilities from Franklin Park, Ill., to its Eastern Division plants in Worcester. The move is designed to strengthen its Eastern Division forging program in missiles, rockets and aircraft, having special emphasis on beryllium fabricating.

"The rapid growth of our work in missiles, rockets, as well as aircraft at North Grafton, Mass., and Worcester plants, necessitated the installation of Prex's type of equipment in our Eastern Division in the interest of more expeditiously servicing customers, with a wider variety of components," said Robert W. Stoddard, president of Wyman-Gordon. "Rather than duplicate the Prex facilities in the East, it was decided to transfer them here.

"We have notified our customers that there will be no interruption in regularly scheduled precision forgings from Prex. To that end, the transfer will take place gradually over a period of some months. We anticipate the strengthening of our effort and service as a result of the transfer."

The Prex transfer coincides with an increase in work with the exotic metal, beryllium, at North Grafton. The North Grafton plant, which was the first in the Western world to have successfully closed-die forged beryllium, has set aside large areas in the plant for its handling and production. The Prex facilities will make it possible to expand this phase of Wyman-Gordon operations.

In addition, beryllium machining, processing and inspection facilities will be increased threefold. Special rooms, installed earlier in the year for the handling of beryllium powder, will be increased in size to permit swifter handling of larger quantities.

Wyman-Gordon acquired complete ownership of Prex in 1956 and it became one of the four plants within the corporate structure of the company, specializing in close tolerance, small, precision forgings—largely in aluminum for the aircraft industry.

In March, 1959, the company announced its break-through in the closed-die forging of the difficult to form metal, beryllium. Since then, demand for beryllium forgings has soared. Most recently, demand has grown for the small, precision type of forgings in which Prex excels. And it was accordingly decided to transfer the Prex facili-

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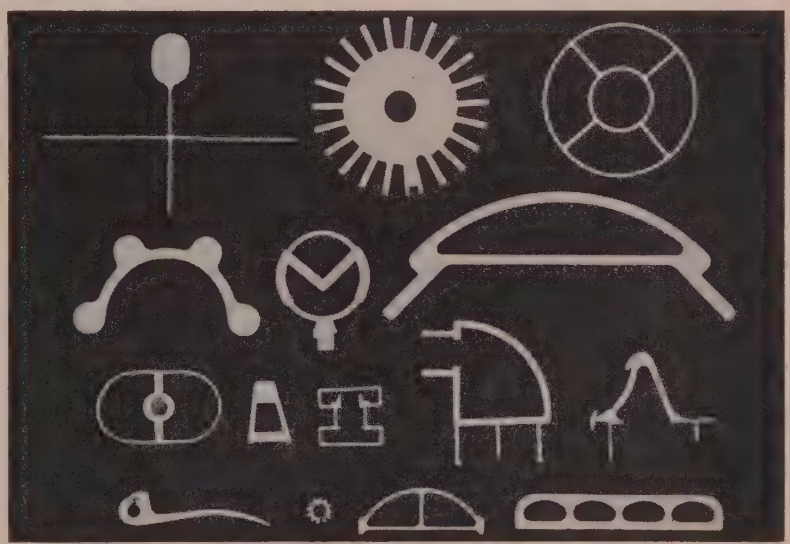

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ties so that all beryllium work, both large and small, could be processed in the special area already in operation at the eastern division.

In addition to beryllium forgings, the company also works in other exotic metals for the missiles and rockets programs and Prex's facilities, production and technology will be required on the smaller components.

Wyman-Gordon's facilities include the world's largest forging press with a capacity in excess of 50,000 tons squeeze power.

Aluminum Construction Combats Corrosion in Dryers

Product drying invariably generates condensation which in turn threatens the drying equipment with corrosion — steel equipment, that is. The all-aluminum dryer pictured skirts the corrosion risk and brings to the user, in this case the Celotex Corp., reduced maintenance costs because it requires no painting.

Aluminum is used extensively in dryer construction for the afore-mentioned reasons, according to The Lanly Co., Cleveland 15, builder of the Celotex dryer. The major portion of the aluminum used by Lanly is in the form of sheet (3003H14) in a variety of gauges from .032 to .064-inch thick.

"We also use a relatively small quantity of bar stock, angle and channels of alloy 6061-T6," a Lanly Co. executive said. "In practically all cases involving the aluminum we fasten by spot welding.

"We first used aluminum on a continuous sanitary ware dryer and this equipment is still in first class condition after five years of operation."

The dryer in use at the Celotex Corp. is 85 feet long overall, and 46 feet, 4 inches wide. It is divided into four zones of control, each zone having a minimum temperature control of 275° F and ranging up to 290, 300, 315 and 325° F respectively in each zone.

Process Fabricates Painted Coiled Strip in Register

A method of fabricating pre-printed coiled metal strip into finished products while maintaining accurate registration has been developed by Sylvania Electric Products Inc. Previously, fabrication of multi-color printed products was done from metal sheets, a slower process, because of registration problems.

Harold E. Martin, product sales manager of Sylvania's Parts Div'n, York, Pa., said the new process makes possible cost savings up to 12% in end products. This is accomplished by using the production advantages of coiled strip without losing accurate registration.

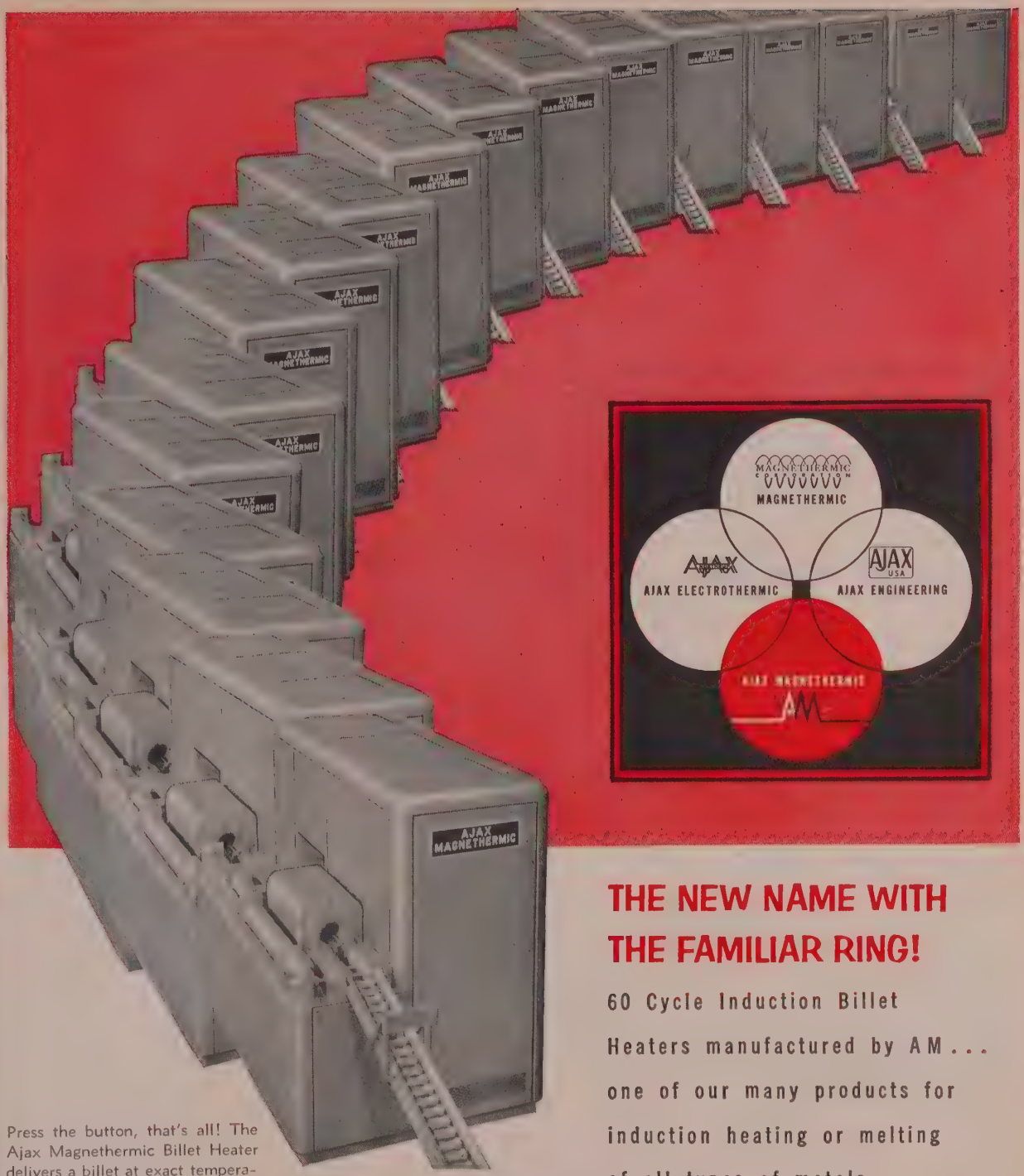
The new process can be applied to printed coiled aluminum or steel strip with a minimum thickness of 0.008 inch, a maximum of 0.022 inch and a maximum width of 15 inches. Registration is claimed to be kept within ± 0.005 inch.

Martin says the Parts Div'n has been fabricating plain coiled strip for almost three years "with excellent quality results," and recently completed production of 61,000,000 parts from plain coiled strip for one customer "without a single reject."

Polish Cleans, Brightens Gives Wax Protection

A product of the Collinite Chemical Co., Utica 4, N.Y., is type 38-3 aluminum polish which is designed to remove accumulation of discoloration and oxide. According to the manufacturer, proper use of 38-3 will produce a brilliant, durable protective waxed coating.

The acid- and caustic-free polish is non-toxic and harmless to the hands, Collinite Chemical reports.



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Argentina Fabricating Firm Being Formed by Kaiser

A new aluminum fabricating company is being formed in Argentina by Kaiser Aluminum International and Guillermo Decker S. A., South American manufacturer of nonferrous metal products.

The new company, Industrias Manufactureras Del Alumino S. A. (IMDASA), will have initial capital of approximately $7-million for the construction of new plant facilities. The plant will be located near major markets and will manufacture a wide variety of mill products for the building, consumer durable, container and transportation industries. Full operation at the new facilities is scheduled for 1961.

Ownership and character of IMDASA will be principally Argentine, with all management and production functions held by citizens of the country. Kaiser Aluminum will invest more than $3-million in the new company and provide management and technical assistance for operations, market development and sales. Its interest will be 49%.

IMDASA plans to erect plant buildings covering 130,000 square feet, with provisions for expansion. Major items of equipment will include melting furnaces, ingot casting and scalping stations, a hot mill and a 4-high cold mill, extrusion and impact extrusion presses. A metallurgical laboratory and office facilities also will be built.

Guillermo Decker has been operating for 50 years and is the largest privately owned fabricator of copper and brass products in Argentina.

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Space Ship Food Warmer Passes "Flight Test"

A small, electric food warmer, designed for Earth-orbiting space vehicles, passed its first "test flight" recently during Project Hermes at Wright-Patterson Air Force Base, Ohio. The small oven (14 by 14 by 4 inches deep) is constructed mainly of aluminum and is heated by resistance elements.

The oven (pointed out in picture) is one of two developed by REF Mfg. Corp., Mineola, N. Y., under a contract with the Air Force Research and Development Command.

Project Hermes was set up to test survival devices designed for manned space capsules. A test subject was sealed in a capsule for a week and space flight simulated as closely as possible. Part of the equipment checked out was the electric warmer which heats food in plastic squeeze bottles.

Resistance heating elements surround three 7 by 2-inch recesses in the oven. Fiberglass insulation keeps radiant heat from becoming excessive. During the test, a little more than an hour was needed to heat food tubes to a safe temperature of about 170°F.

Another oven, still under development by REF, uses solar energy collected by a magnesium plate and conducted into four heating chambers containing food tubes. Only control needed is a thermometer which tells crew when exterior panels should be moved to reduce heat intake.

Washers Can Perform a Vital Service

In the early development stages of missiles, a faulty washer could guarantee a missfire, and this high-priced slip-up suggests that washers have come a long way from the time when, made of felt, they served as lubricant retainers in chariot wheels.

In any event, Penn Fibre & Specialty Co., Philadelphia 34, built a business around this lowly component. Since its inception in 1937, the firm has specialized in washers, discs and gaskets, working vulcanized fibre and laminated phenolics exclusively until World War II. Then they yielded to the increasing demand for metal washers of all kinds.

"As a result we've made many millions of special size aluminum washers along with all types of nonmetallics and plastics," said William K. Davis, vice president.

Washers produced by Penn Fibre are made to order to fit specific engineering designs and conditions, Davis said. No stock items are carried.

Aluminum Door Stripping Stops Dust, Dirt, Noise

A mechanical device that automatically shuts off under-door drafts, dust and noise when a door is closed is being produced by Reese Metal Weatherstrip Co., subsidiary of National Metal Products, 712 Park Ave., Minneapolis 15, Minn. Specifically designed for interior doors, the Stop Air Automatic Door Bottom sells for approximately $3.

The door bottom is in a raised position when the door is open so it can swing over carpeting. When the door closes, a button automatically actuates a mechanism which forces the door bottom down tightly against the sill.

The aluminum device is attractive, too, and comes with a smooth, hard vinyl coating in either clear or gold. It requires only three screws for installation; fits both right and left hand doors; comes in 28, 32 and 36 inch sizes, and can be cut 4 inches to fit standard doors.

Shipments of Most Mag Products Up in 1960

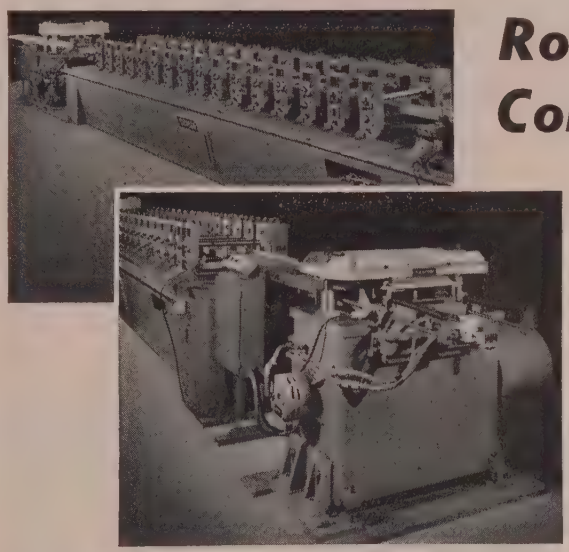
Shipments of magnesium die castings and wrought products are up so far this year, as compared to last, according to figures released by the Magnesium Association and the Bureau of the Census, U. S. Dept. of Commerce.

Shipments of die castings through April, 1960 were 1293 tons as compared with 759 tons shipped in the same period of 1959—an increase of 70%. Average monthly shipping rate has been 323 tons (April tonnage was 322), while 1959 months averaged 267 tons.

Overall shipments of castings in April were up 1% from March—963 tons from 952. Cast anode shipments in April were up to 293 tons, 17% above the 250 tons shipped in March. Sand and permanent mold castings dropped in April, the former down 7% to 318 tons, the latter down 50% to 30 tons.

An 11% increase in shipments of wrought magnesium products was registered in May. Shipments totaled 995 tons, a substantial increase over April's 895 tons. Shipments through May, 1960 totaled 4503 tons, less than 1% above tonnage in the similar 1959 period.

However, production of primary magnesium ingot in May was 4% off April's pace, from 3370 tons to 3258. Production of 16,675 tons through May was running 67% above last year when only 10,003 tons were produced.



Roll Form Coil Stock • BY THE MILE

Fully coordinated roll forming production lines, such as the above Ardcor installation, produce finished products on a miles-per-day basis.

Here an embossed, aluminum section of .019" stock is being formed by a leading aluminum manufacturer at a rate of 200 ft. per min. An Ardcor Prenotch Press, lower photo, and an Ardcor Cut-Off Press, upper left photo, complement the high performance of the popular Ardcor 1-F Roll Forming Machine.

Ardcor can furnish complete roll forming lines for a wide variety of shapes and sizes — to customer specification.

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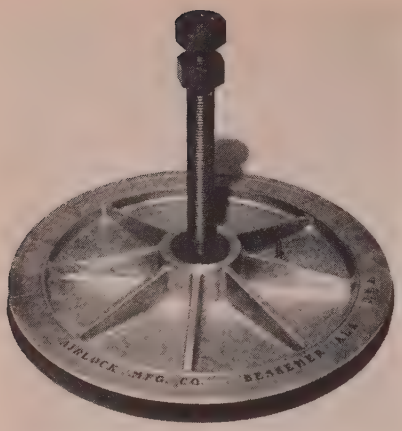


Vacuum Pads Can Lift From 25 to 4000 Pounds

A line of vacuum pads for handling aluminum, steel, stone and concrete slabs, brass, wall board, etc., and ranging in capacity from 25 to 4000 pounds rated safe lift, are being produced by Airlock Mfg. Co., 421 N. 20th St., Bessemer, Ala.

The 4000-pound pad is said to be the largest vacuum pad offered for sale as a standard item. It is made of cast aluminum and comes with either a rigid or flexible mount. The firm's line also includes vacuum lifting units and automatic vacuum handling machines.

Big Aluminum Barges To Haul Liquid Chemicals

Plans to build the world's two largest aluminum barges have been announced by Reynolds Metals Co. The barges will be used for transportation of sensitive liquid chemicals.

William G. Reynolds, executive vice president in charge of research, disclosed the signing of a long-term contract between Reynolds and National Marine Service, one of the leading inland waterways carriers. Most of the aluminum for the barges, including the heavy plate for the hulls will be made at Reynolds' McCook, Ill., sheet and plate plant.

Under the contract Reynolds will build and then lease the barges to National Marine. First barge will be used on the Mississippi-Ohio river system for shipments from Texas ports to Chicago and other Midwestern cities. Plans for the second barge were not disclosed.

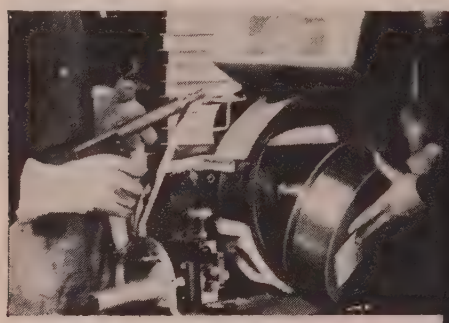
The first barge will be 130 feet long, 50 feet wide, 12 feet deep, and due to its light weight, will draw only 8.6 when loaded. Its cargo tanks will hold 12,500 barrels and it will carry 1600 short tons — 20% more than is possible on steel barges of the same size and draft.

The ship hull is said to be the biggest ever built of aluminum. It will use a special double-skin construction made from corrosion resistant alloys specially developed for this use.

The barges were designed by Reynolds' product development center in Richmond, under the supervision of Heinz V. Menking, general director of product development. Work was done in cooperation with National Marine and H. M. Tiedemann & Co., Inc., New York marine research and development consultants to Reynolds. Construction will be done in accordance with the requirements of both the American Bureau of Shipping and the U. S. Coast Guard.

"The barges will greatly simplify shipment of certain difficult to handle liquid materials," says D. A. Wright, president of National Marine. "The rust free characteristics of aluminum will permit the handling of products not previously carried and minimize risk of contaminating such sensitive cargoes as alcohols, detergents and jet aviation fuel.

"It will be feasible to alternate chemicals of different characteristics with little difficulty since tanks can be rapidly and thoroughly washed between loads. We will save in operating costs because the reduced weight of the barges will enable them to carry more payload for less fuel cost per ton," he added.



Loading 10 lb. spool of #4043 aluminum wire at Michael Flynn Manufacturing Co., Philadelphia. Aluminum in this particular spool was used in welding curtain walls for skyscraper at 2 Broadway, New York City.

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New Finishes Aid Corrosion Resistance

Six metal finishing processes have been added to the line of Allied Research Products Inc., 4004 E. Monument St., Baltimore 5.

Three of these formulations are Iridite chromate conversion coatings for providing corrosion protection, paint base preparation and final finishing of nonferrous metals. They come in powder form. Iridite 1P, is said to provide the same advantages as Iridite 1, but offers easier solution control. The material produces a dark green, olive drab film on zinc plate or cadmium plate.

Iridite 7P, formerly 7, produces a high lustre with a chemical polish on cuprous surfaces, and also protects against corrosion and tarnishing ranging from a heavy-duty film to a mild passivation. Iridite 11P provides a clear, bright protective and decorative film on zinc plated surfaces. The film can be dyed to a variety of pastel colors.

Both the new brighteners, 333 and 334, are for high current density plating in cyanide zinc solution. They are identical, but 333 is a more concentrated form. Isobrite 625 is a liquid organic addition agent designed to transform a basic copper solution into a high-speed, efficient, semi-bright copper.

Grid Flooring Fosters Plant Safety, Hygiene

With the recent installation of about 1600 square feet of Alaflor aluminum grid flooring, Scottish Malt Distillers Ltd. have insured floor-level cleanliness and safety underfoot for its Glenkinchie distillery in Scotland.

Alaflor, made by Northern Aluminium Co., Ltd., England, is a self-supporting industrial floor, walkway and stair-step material in the form of extruded aluminum planks. The extruded section is a flat-topped channel with deep I-section ribs for strength and rigidity. Square or rectangular holes are punched in the sections and combined with longitudinal serrations to provide foot traction.

The distillery flooring was made by welding 6-inch wide, 1¼-in. deep sections into panels, which were cut to shape to fit around large vats (picture), and banded at the open ends and sides with flat aluminum bars. Panels were clamped to the steel framework and an insulating strip placed between faying surfaces. Treads of the steel stairways are also of Alaflor sections.

Titanium Aircraft Fasteners Weigh 40% Less Than Steel

One of four wheel-well doors for a Boeing B-52G bomber uses titanium fasteners which replaced steel rivets and bolts and slashed fastener weight 40%, according to Aeronca Mfg. Co., who produces the doors in Middletown, Ohio.

One type of titanium hi-shear rivet used costs 89 cents while its equivalent in steel costs a nickel, Aeronca reports. Another titanium bolt costs $2.69. Aeronca says that 1856 pieces of titanium hardware go into a set of wheel well doors. Total weight of the pieces is 6.51 pounds, as opposed to 11.58 pounds for steel.

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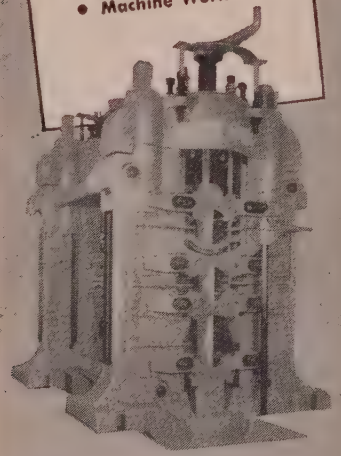

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Army Amphibian Takes Almost 5 Tons of Aluminum

The Army's new LARC-15 ship-to-shore cargo lighter is another example of where aluminum is contributing to greater mobility and versatility in military equipment.

Because of a unique weight-saving design utilizing aluminum in the hull and drive housing, the LARC-15 is the only amphibian which can carry virtually its own weight. The carrier weighs 35,050 pounds empty, and 65,000 pounds fully loaded.

The LARC-15, which derives its name from "lighter, amphibious, resupply cargo," was developed by the United States Army Transportation Research Command and has been manufactured by the Ingersoll Kalamazoo Division of Borg-Warner Corp.

Overland, the amphibious craft can reach a speed of 20 mph and in the water it can travel at nearly 10 mph. Its function is to transfer over 15 tons of cargo from a ship, across water to an inland unloading point and then return to the ship for repeat trips.

A total of 9500 pounds of aluminum sheet, extrusions and castings have been used in each LARC-15 prototype fabricated to date. The hull includes 8000 pounds of 5086 alloy sheet and 5083 alloy extrusions. The 356-T6 alloy castings are used for housing the drive mechanism.

Aluminum alloys 5086 and 5083, which were developed by Kaiser Aluminum & Chemical Corporation at the company's Department of Metallurgical Research near Spokane, Wash., are high strength, weldable aluminum-magnesium-manganese alloys frequently used for military equipment. The LARC-15 hull is welded by the inert gas, metal arc (MIG) process.

A smaller version, the LARC-5, has performed successfully for the Army under a severe test program during the past year. Alcoa, Kaiser Aluminum and Reynolds Metals Co. have all contributed metal and technical information in the LARC-15 development.

Thermocouple Measures Metal Heat To 2200F

A new thermocouple assembly, Alodure, designed especially for molten aluminum and magnesium applications, is being produced by Pyrometer Co. of America, Inc., Penndel, Pa.

The protecting tube consists of an immersion length of a reinforced Fiberfrax base material (not a coating) usable up to 2200°F. It exhibits the strength of a metal protecting tube and corrosion resistance superior to that of any known ceramic tube, claims the firm.

Other claims: The material is not wetted by molten aluminum, will not contaminate critical melts with iron or other foreign metallic impurities; its mechanical strength and resisitance to wetting make it useful for all molten aluminum temperature measurements.

The assembly is available in both Iron-Constantan and Chromel-Alumel calibrations. They have a 1¾ inch OD and are supplied in 6-inch increments from 12 to 48 inches.

Titanium Helps Slash ICBM Motor Weight 33%

A solid-fuel third stage motor housed in a casing made entirely of titanium, could significantly increase the range of the Minuteman ICBM missile. This is the claim of Aerojet-General Corp., Downey, Calif., manufacturer of such a casing, which is one-third lighter than conventional steel units.

The motor has been successfully fabricated and fired, reports the firm. "The lightweight metal has always been attractive to the weight conscious missile industry, but until now no large titanium rocket motors had been fabricated and fired successfully in full-scale, full-duration static tests," Aerojet reported.

Aerojet said the case withstood the tied-down motor test firing so well that it will be cleaned, reloaded and fired again. The firm said advances in titanium welding and machining techniques helped development of the case.

Ultrasonic Welder Joins Foil, Other Thin Metals

A self-tuning ultrasonic seam welder for aluminum foil and other thin metals can be used in foil manufacture and conversion, packaging, winding of foil condensers and transformers, and joining of thin refractory metals for space vehicles.

The Inson seam welder was developed by International Ultrasonics Inc., Rahway, N. J., and is being installed in all Reynolds Metals Co.'s foil manufacturing facilities. The machinery is used with processing equipment to splice breaks or attach new rolls (see picture).

The welder has traversing heads for applications where the seam crosses a stationary web, or stationary heads for package sealing or other operations along a continuously moving web.

Self-tuning reduces reliance on operator skill and improves weld uniformity and reliability, according to International, by automatically adjusting welding frequency to optimum value despite fluctuations in accoustical conditions at the welding tip due to variations in material thickness, cleanliness.

A special output transformer permits transmission of ultrasonic power over long cable lengths. This, plus self-tuning, allows remote location of the power generator. It also permits one generator to operate any one or more of several welding stations through a distribution panel, even though welding requirements differ from one station to another.

The welder produces continuous electrically-conductive seams without joint bulging. The joints, said to be stronger than parent metals, will pass through laminating and printing equipment, and condenser or transformer winding machinery, without interrupting continuous operation.

Material as thin as 0.00017 inch and as thick as 0.006 inch has been successfully joined with the new welder, but these are not ultimate limits, says the manufacturer. Dissimilar metals, and metals of different thicknesses, can be joined without contaminating the seam. Physical structure of base metal is unaltered. No preparation beyond simple degreasing is normally required, says the manufacturer.

Clear Coating Dries Fast, Gives Hard, Glossy Film

A clear, colorless coating for a variety of metal surfaces dries almost instantly after application to form a high gloss, hard protective film that is resistant to salt air, water and weathering.

The material, designated FF 111 by its manufacturer, Magnus Chemical Co. Inc., Garwood, N.J., is claimed not to yellow or peal and can be top-coated with almost any conventional enamel or paint.

FF 111 is said to prevent oxidation, pitting, staining and tarnishing of aluminum surfaces on truck bodies, aircraft, storm windows, etc., and is widely used to restore color and gloss to old, faded enamels on diesel locomotives, farm machinery, tank trucks, etc. It can be applied by spray, dip or brush.

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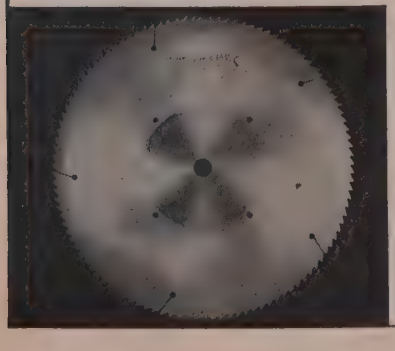
Available in sizes from 4" to 36" diameter, any tooth spacing and thickness.

With locked-in tips and vibration dampeners.



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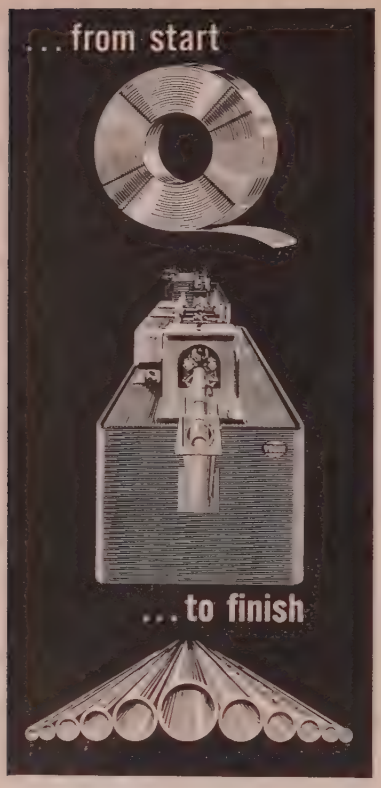

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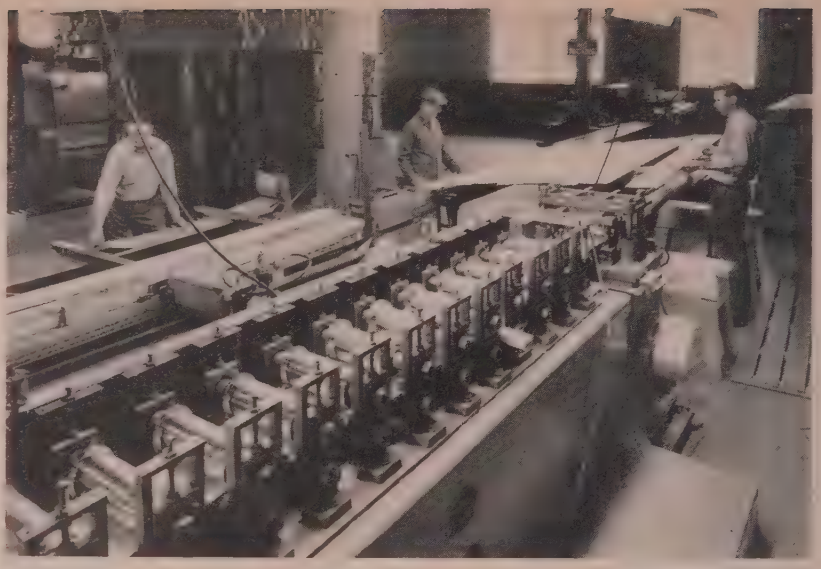

Lap Siding for Remodeling Has Interlocking System

An aluminum push-up type lap siding is being produced in both insulated and non-insulated form in standard lengths for remodeling purposes. Called Marathon, it is a product of Security Aluminum Co., Detroit 3.

Panels have an interlocking system called Para-Lock which the firm says assures constant contact and perfect spring tension along the entire length of a panel at all times and under all conditions. (Picture shows equipment used to roll form the Para-Lock design.)

Siding carries a 10-year factory guarantee against chipping, cracking, blistering or flaking. It is pre-treated with Bonderite by Parker Rust Proof Co., and roller-coated with Sherwin Williams Super Clad 500 vinyl finish on both sides. All colors are available and siding comes with pre-punched elongated holes to allow for expansion and contraction.

Marathon panels are ventilated and laminated to backer boards for stability and moisture-resistant insulation.

Security has a program to assist siding sales. It includes a sales presentation book for novice salesmen, filmed TV and recorded radio commercials, a standard news mat service and a sales kit which converts into a counter display.

Plan New Special Metals Fabricating Plant

A wide range of special metals will be fabricated in a new plant to be occupied by Calumet & Hecla, Inc., Chicago, at Inkster, Mich. H. Y. Bassett, C&H president, said that titanium and zirconium will be the first of the "space age" metals to be processed in the 60,000 square foot, $1.6 million facility.

At the outset the plant will produce tubing and rod. Wolverine Tube Division of Calumet & Hecla is already experienced in fabricating these shapes in titanium and zirconium. Later on the plant, formerly used by Flexonics Corp., another C&H subsidiary, will handle such special metals as molybdenum, chromium, vanadium, tantalum and others.

Current uses of zirconium are in nuclear reactors and chemical processing equipment which also makes use of titanium because of its great resistance to corrosion.

New Cleaning Compound Erases Hard-Water Spots

A new alkaline cleaning compound for use in spray washing operations has been introduced by The DuBois Co., Inc., Cincinnati 3, Ohio. The company reports that DuBois 422 is especially formulated for use on metals where hard water spotting and lime deposits are a factor and where the user wants to disperse pigmented drawing compound.

"It has shown it reduces the need for pre-soaking or other auxiliary cleaning, in addition to stopping streaking and shadows on washed work," the manufacturer said.

DuBois product researchers say "422" actually makes water hardness work for you, not against you. It retards the rusting of washed parts and is safe on aluminum, tin and most other soft metals. There is no danger of alkaline carry-over into the phosphatizing stage, DuBois laboratory men say, because it rinses completely. It is introduced to the spray washer from the drum.

Camping Unit Sleeps Six, Stores Equipment

A prototype of the Forecast Accordium, a mobile camp unit which when opened sleeps a family of six, was recently displayed at the International Mobile Home Show on the Indiana State Fair Grounds.

The unit was designed by Henry Glass for Alcoa's Forecast program which commissions outstanding designers to create new uses for aluminum. Glass is head of Henry Glass Associates, design consultants, and is an instructor in industrial design at the Chicago Art Institute.

When opened, the unit encloses a 700-cubic-foot area. When closed it measures less than 200 cubic feet. It can be pulled behind an auto at the same time storing mattresses, blankets, clothing, and camping equipment.

Two swing-around panels form the front of the Accordium when in use. Their front surface is the fold-up rool that provides sun and rain protection. The portion of each panel closest to the center of the shelter is an entry

door to the sleeping areas. The balance of one panel is a compartmented storage area for utensils, staples, and other camping materials. The other panel contains fold-down table and benches to accommodate six people.

Skeleton of the Accordium consists of seven rigid aluminum ribs — rectangular frames, 6½ feet high and 7½ feet wide, fabricated from 6-inch-wide extruded aluminum channels. Its skin is a translucent, laminated vinyl and nylon mesh membrane, with six sections each about three feet wide at the periphery joining the seven ribs.

At the inner core the vinyl membrane

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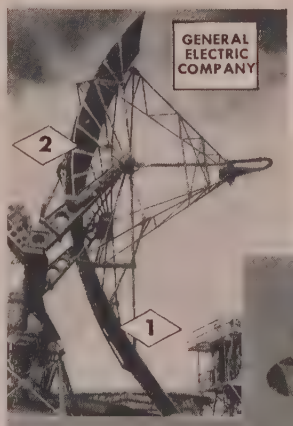

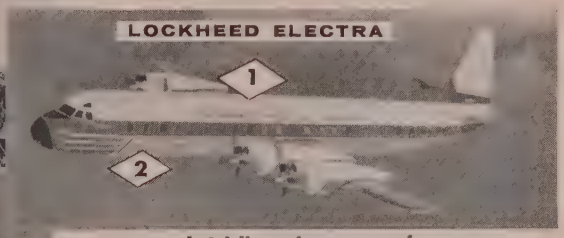

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ON MAGNESIUM—short immersion, room temperature solution, no electrical equipment. Corrosion protection relatively unaffected by high drying temperatures. Applicable to all alloys. Low electrical resistance. Color ranges from light gray to dark brown.

IRIDITE—a specialized line of chromate conversion coatings for non-ferrous metals. Easily applied at room temperatures with short immersion, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel; special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILES.

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sections are less than two inches wide at top and bottom where the ribs come together. A waterproof connection joins the aluminum ribs to the plastic walls. Along the outer edge of the Accordium, built into each section of the plastic wall, are aluminum ventilation flaps covering permanently screened port hole vents.

The Accordium is not on the market, but may someday be manufactured.

Overarm Feeder Handles Sheet Up to 6 by 20 Feet

Giant overarm units for feeding sheets from a pile to processing or conveying equipment, or for piling already processed sheets, are being produced by the de Florez Co., 200 Sylvan Ave., Englewood Cliffs, N. J. Sheets handled can be as large as 6 by 20 feet and of various metal and non-metal materials.

The feeder grasps sheets with vacuum cups supported on a carrier mounted between two oscillating arms. As the arms rotate from one side of the machine to the other, they lower the carrier to engage a sheet on one side, then transfer carrier-and-load to the other side where the sheet is deposited. The carrier automatically returns for another sheet unless set for single cycle operation.

The first of the new large-size feeders is in use at an Alcoa plant. The vacuum cups are positioned to peel the oily sheets at the corners first, with the arms pivoting slowly at first, then accelerating once the sheet has been separated from the pile. The feeder can handle up to 10 sheets per minute.

The hydraulic unit handles rectangular or irregularly shaped sheets, flat or formed sheets, and can pick up or deliver sheets vertically as well as horizontally. It requires floor space only slightly larger than the sheets being handled, has no elevator, stacks sheets in piles 30 inches high, does not mark the sheets, and is easily serviced since piles are alongside rather than under the machine.

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Financial Briefs

Alcoa First Half Net Down From Last Years' Period

Net income of Aluminum Co. of America for the first half of 1960 totaled $21,726,308, or 96 cents per common share. Income for the same period in 1959 was $28,936,333, or $1.32 per common share.

Sales and operating revenues for the first six months were $443,028,951, compared with $424,910,806 in the same period last year.

Net income for the second quarter of '60 was $9,091,262, or 40 cents per common share, compared with $18,210,903, or 83 cents in the second quarter of '59.

Best Half for Bohn Since '55 and '56

Sales and net earnings of Bohn Aluminum & Brass Corp., Detroit, in the first half of 1960 were the highest for any first-half period since 1956, while earnings per share were the highest since 1955.

Net sales in this half were $27,528,464, compared with $23,122,220 in the same period last year. Net earnings for the six months, after provision for taxes, were $863,368, equal to $1.81 per share on 477,852 common shares outstanding. This compares with a net income of $824,700, equal to $1.73 per share on the 477,552 common shares outstanding in the comparable period last year.

Terry Kuhn, president of Bohn, expects that the company will match this performance in the last half of '60 and

attributes the fine showing to heightened operating efficiency and greater diversification.

Harvey Aluminum Net Up 17%

Net earnings of Harvey Aluminum for the nine months ended June 30 are up 17.3% above the like period of 1959, Lawrence A. Harvey, chairman, reported. He expects profits for the last quarter to continue at the same rate of increase.

In the 1960 period, sales amounted to $42,627,955 for a net income of $3,679,377. For the nine month period last year, sales were $46,394,330 and a net of $3,137,310.

Harvey indicated that the company's order backlog for titanium and zirconium (they're primary producers of these metals, too) is at record levels.

Record June Results In Excellent 2nd Quarter for Kawneer

The largest June business, both sales volume and profits ever experienced by Kawneer Co., Niles, Mich., was done this past June, according to President Lawrence J. Plym. He said that improvement over the first quarter rate had become obvious in May, to be confirmed solidly the following month.

Result was that second quarter results very nearly equaled the second quarter of 1959 even though the start had been poor in '60. Sales of $9,416,666 produced a net of $385,226, compared with sales of $9,664,936, for a net of $413,294 in the comparable period in '59. On a per share basis net income amounted to 41 cents compared to 44 cents last year. For the first six months of '60 net income has been equal to 51 cents per share compared to 72 cents for the like period in '59.

Olin Sees Progress In Aluminum Operations

Aluminum operations of Olin Mathieson Chemical Corp. continue to progress despite the "unsatisfactory market conditions," according to a joint statement of Thomas S. Nichols and Stanley de J. Osborne, president. They said the company's losses from aluminum were reduced in the quarter and the first half.

Despite a second quarter decline, first half sales and earnings showed an increase over the comparable period last year. Sales were $348,281,000 for a net of $18,666,000, or $1.40 a share, compared with $347,296,415, netting $17,504,095 and $1.32 a share in the first half of '59.

Revere Net Down From 1959

Net income of Revere Copper & Brass Inc. for the six months ended June 30, 1960 was $3,831,305, equal to $1.43 a share on 2,677,905 shares of common stock outstanding. This compares with a net income of $5,306,453, or $1.99 a share, for the same period of 1959 when there were 2,657,406 shares outstanding.

Revere reported that the brass mill industry shipments dropped about 14.8% from the comparable '59 period, and that fabricated aluminum sales also showed a substantial decrease throughout the industry.

The company attributed the drop in earnings to lower volume and reduced margins of profit necessitated by low-priced imports and price competition within the domestic industry.

Reynolds First Half Net Down From Last Year

Reynolds Metals Co. reported net sales of $216,114,000 for the first half of '60, compared to $239,486,000 for the same period last year. The company's second quarter earnings were up from those for the first quarter of 1960.

Net income for the half amounted to $13,218,000, compared to $20,609,000 for the first half of '59, including equity in net income of unconsolidated subsidiaries and associated companies of $1,858,000 in 1960 and $840,000 in 1959. On a per share basis the net was equal to 66 cents a share on 17,002,000 shares of common outstanding, after dividends on the company's preferred stocks. Earnings for the same period in '59 were equal to $1.10 a share.

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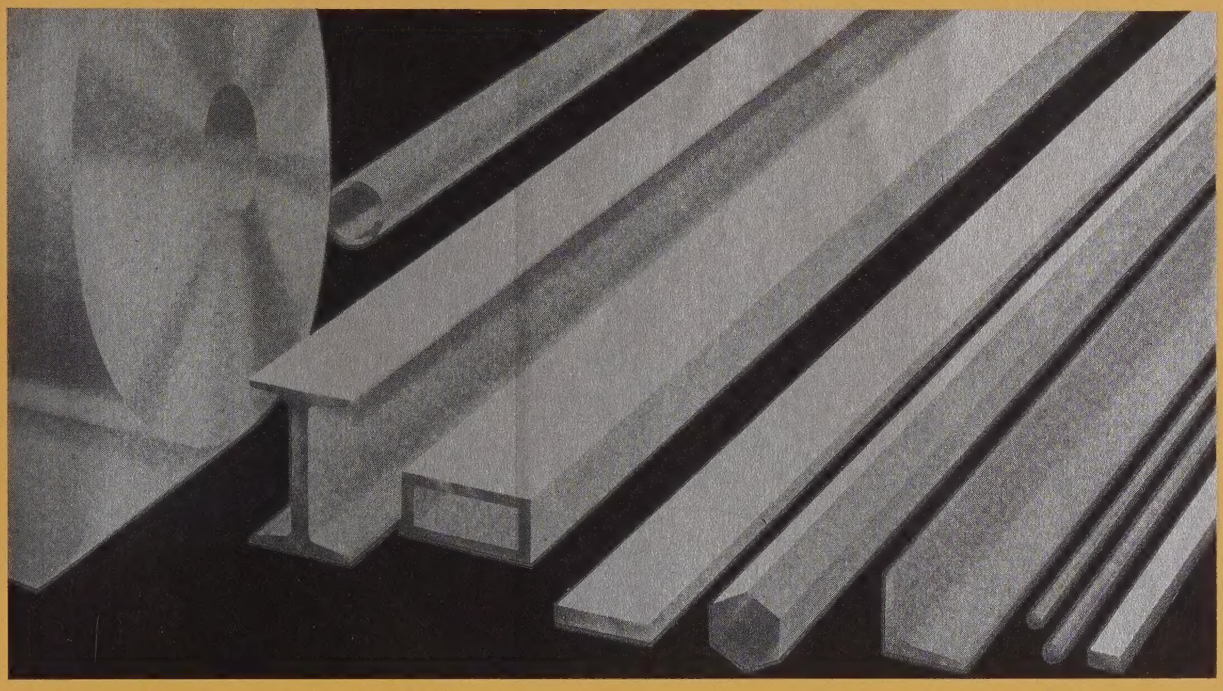

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Looking Ahead

Prices, production, policy and public reaction dominate aluminum industry gossip these days. Nearly all year, metal men have wondered if the aluminum producers could keep production at 85% of capacity even though domestic demand has failed to live up to advance billing. Kaiser, the first to face reality, cut back to 78% of capacity by closing a potline in Washington late last month; then one in Louisiana this month. It was a logical move since Kaiser makes fewer end products than its competitors; cannot match Alcoa and Reynolds on ready-made European markets; and has all but abandoned the soft alloy extrusion market in hopes of grabbing more billet business.

Happily, aluminum is booming overseas. Exports to expanding markets abroad have helped keep many a U. S. potline running. At the same time, imports of semi-fabricated aluminum have slowed somewhat. But unless a sharp business upturn develops – and that looks highly unlikely – domestic primary production will soon be cut back still more – perhaps to 70-75% of capacity. The producers will follow the example of steel and copper: When the metal won't sell, close the plant.

Some say aluminum pricing today is worse than the gasoline wars ever were. Some users can show you purchase orders that make a mockery of so-called price lists. Much of the present "wholesale" pricing in nearly all types of aluminum products results from efforts to hold production at unrealistically high levels. But the practice of "giving the stuff away" may finally be on the way out – among the big producers, at any rate. Big reason: Extremely poor earnings (see "Financial Briefs," page 94) have prompted stockholders and bankers to needle management – who, in turn, are asking their sales departments why they have to give the stuff away.

Nearly nobody is breaking even on fabricated products. The quip in one head office is to the effect that sales of mill products increased "so we're losing more money than last month." Nearly all aluminum items are currently sold as either "loss leader items," or as commodities in an effort to attract new tonnage uses that might bring in big profits. But some metal men are wondering why the aluminum producers have planted such a big crop when they know there'll be a drought this year.

Long-term growth prospects of the aluminum industry have attracted the investor, but he's becoming impatient; wants to reap some income on his investment. He's not looking for a wild speculative plunge – just a reasonably safe investment with good growth prospects. If stock buyers are scared away by erratic behavior of the aluminum industry, further expansion could be choked off by the lack of new investment capital.

Maybe some price stability will arise out of the present chaos. With prices at rock-bottom now, there is no direction to go but up. The price book was discarded early this year when everybody started offering a "better deal" on everything from sheet and extrusions to rod, wire, etc. Purchasing agents have had a ball scaring hell out of salesmen who have nothing to offer but a cheaper price. Here's a rundown on the pricing pattern during the past year.

Last fall an allegedly new product called "building sheet" was brought out at 5 cents under regular sheet prices. After wage settlements last December, the price of aluminum was hiked 1.3 cents a pound to 26 cents. But extrusion prices kept slipping and commodity pricing became a way of life. Producers' earnings declined early in the year; got worse by mid-year. In June Alcoa decided it was losing money on building sheet; upped the price ½-cent a pound; tried to restrict its use to building applications.

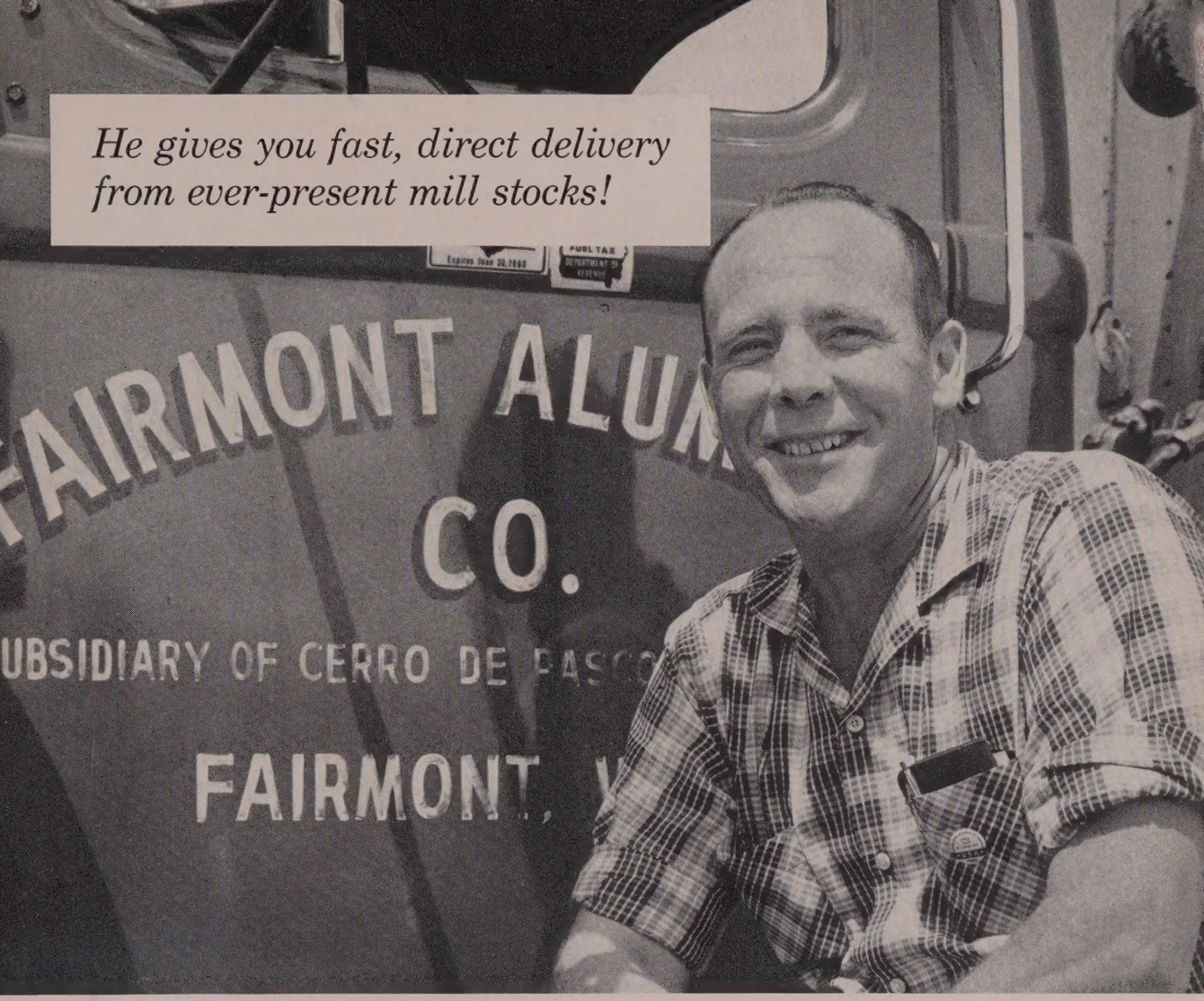
In July the French aluminum industry raised the price of primary aluminum 1.02 cents to 23.6 cents a pound, putting more profit into U. S. exports. A few days later Aluminium Limited started offering extrusion billet at 28.3 cents, less 1 cent for scrap allowance. (Limited couldn't compete in scrap conversion deals that were shaving 1 to 2 cents a pound off the price of billet.) Some extruders, sick of wheeling and dealing in the scrap market, welcomed the move. U. S. producers called it ridiculous.

Another price cut came July 22 when Central Steel & Wire, Alcoa's biggest midwest distributor, slashed sheet prices – in some cases 3 cents below mill prices. The move cut warehouse profits on aluminum sheet by as much as 64% on some quantities. Some veteran warehousemen say the move was forced by small newcomers who will do anything to get an order. Others claim that Central is not too aggressive in aluminum anyway; used the price cut to offset the poor performance of its salesmen. Others say the move was aimed at only 5% of the market. It could hurt the profit picture of mills throughout the country, too, but by August 5 Central was revising prices upward. The cut won't stick.

Alcoa increased most semi-fab prices August 1st. Although the reason given was this month's 11.5-cent wage boost, the move looked like an effort to firm up prices in a sagging market. Price of pig (to be called ingot, hereafter) remained unchanged, as did certain commodity prices (Modern Metals will publish full details on prices next month).

But will the new prices stick? There is some indication that they may, because many aluminum firms are tired of just spinning their wheels. The new switch is that the price of raw aluminum was not increased – just what fabricators have been clamoring for.

— The Editors



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